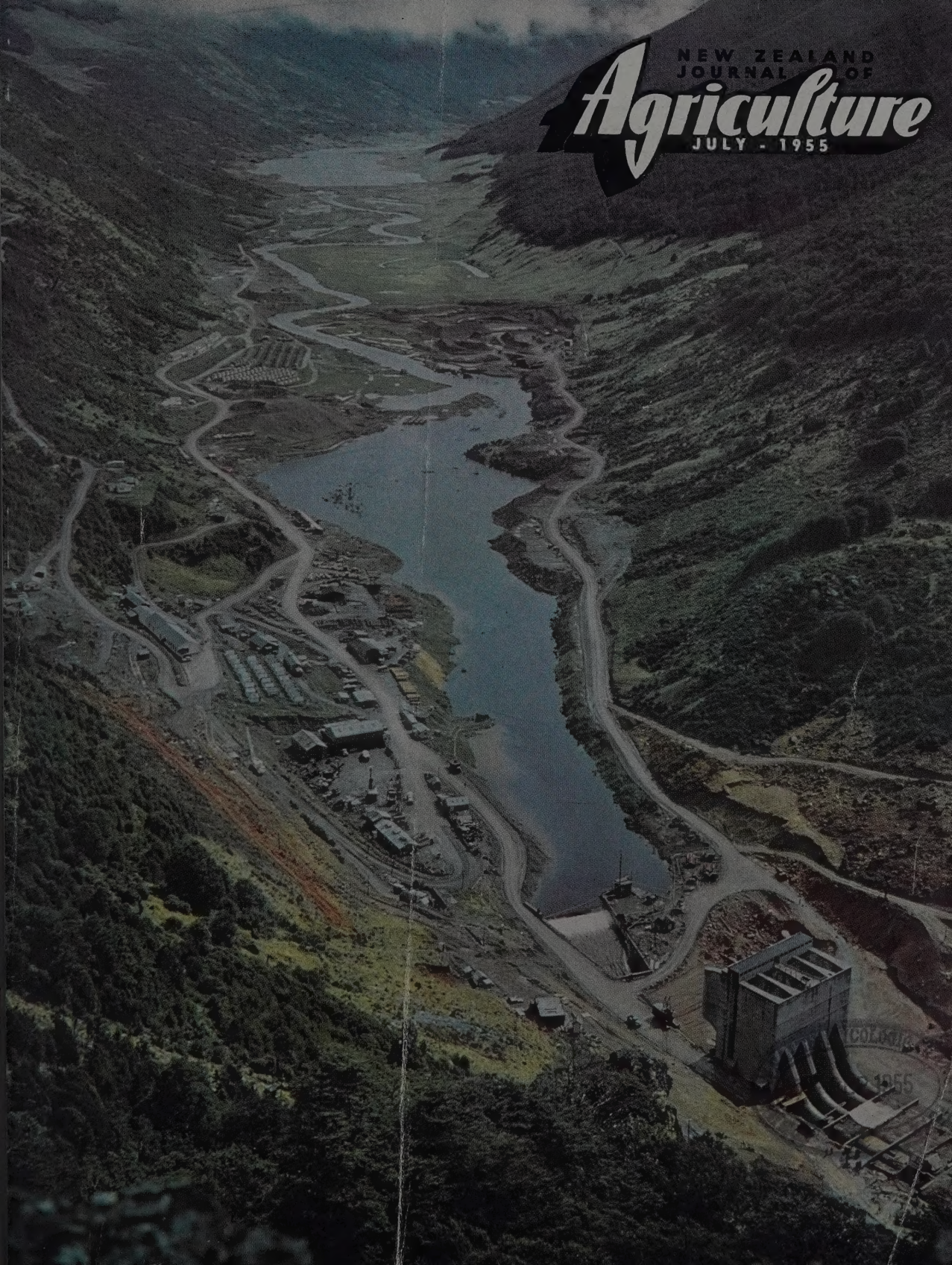
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This Month's Cover

An impressive view up the steep Cobb Valley with the dam for the hydro-electric station in the foreground is the subject of this month's cover. It has been reproduced from a colour photograph by J. Johns, Photographer, New Zealand Forest Service. Preservation of the native forest and alpine shrubs and grasses in the catchment area to check erosion is a feature of the Cobb River hydro-electric development. As in most of the Nelson high country the predominant cover is silver and mountain beech.

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Land Development in Nelson District

By R. H. SCOTT, Land Utilisation Officer, Department of Agriculture, Wellington

SOME farming systems become synonymous with certain districts and this is the case when the name of Nelson is mentioned, for one immediately thinks of apples, hops, and tobacco. Though the output of these products is of considerable economic importance to the district, the area they occupy is relatively small, being little more than a fringe round Tasman Bay and areas along valleys of rivers such as the Motueka and Riwaka. Little is heard of the remainder of the district. What then does comprise the Nelson district and what use is being made of its farmable hill lands?

IF it had not been for a severe earthquake, there are a number of people in the Dominion to whom Murchison would be no more than a name, but this area comes within the confines of the Nelson Land District and though the Murchison Valleys are not large, the annual output of approximately 490 tons of butter from these mountain valleys cannot be despised. The names of Takaka and Collingwood connote to some people a long drive over a 2600ft. hill which until better road access became available in recent years was to be avoided if at all possible. Again to many New Zealanders they are little more than names, but they are also included in the Nelson Land District. How many realise that much of the Takaka Valley has a climate similar to the milder districts of the North Island, with lemons, passion fruit, and grapes growing excellently outside and paspalum thriving in the pastures as it does in the north? How many, too, have heard of the Waikoropupu Springs in this valley, from which come 400 million gallons of clear, sparkling water per

day to start on its short journey to the sea a vigorous tributary of the Takaka River?

Nelson District

The Nelson Land District as an administrative area occupies approximately 4.3 million acres, but the area which is served by the City of Nelson and which can be regarded as tributary to this city is smaller and includes the Counties of Waimea, Takaka, Collingwood, and Murchison, these comprising approximately 2.5 million acres. Of this area it is estimated that not more than 3 per cent. is flat land, the remainder being rolling, hilly, and mountainous country. There are narrow valley floors along the main rivers and their tributaries which widen to the small alluvial plains near the coast of which the Waimea Plain, extending down to Tasman Bay, and the triangular Takaka Plain in Golden Bay are the largest. The only sizable area of alluvial flat land in inland Nelson is the Four Rivers Plain, centring on Murchison.

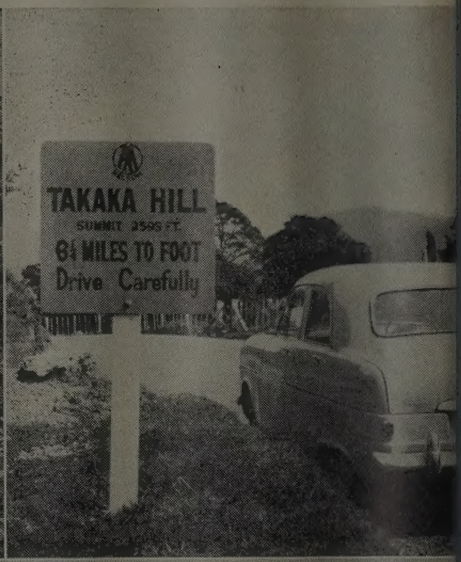
Considerable areas are over 3000ft. in altitude and they are of no farming value. Some indication of the large area of land that is unsuitable for farming can be gauged from the fact that of the district's land area of 2.5 million acres only 950,000 acres or about 40 per cent. is occupied by farmers, but even then not all of this area is used for farming.

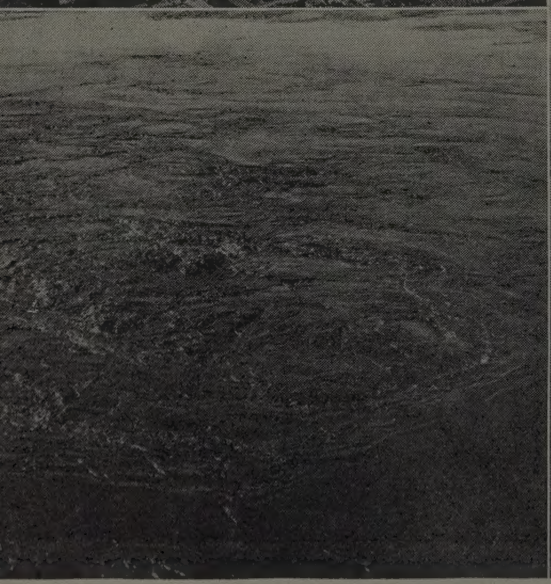
Illustrations: Above—Aerial topdressing on eastern Takaka hills. During the 1954-55 season approximately 200 tons of superphosphate was spread in the area by aircraft. Above on opposite page—Applying lime with a bulk topdresser on newly broken in Moutere hill country. These soils are very deficient in lime. Below on opposite page—Sheep grazing on improved pastures on Mr. C. F. Shuttleworth's property in 88 Valley. The hill at right is unimproved Moutere country.

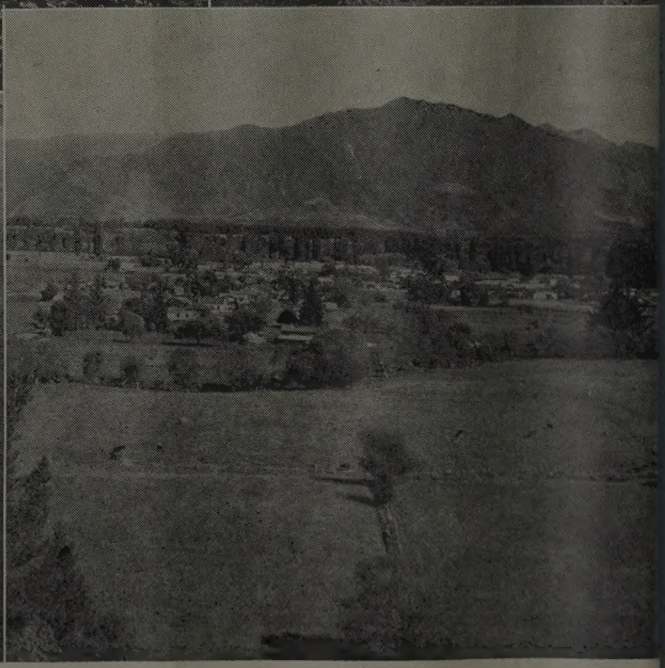
Early Development

The first South Island settlement was at Nelson, where settlers arrived in early 1841, and as might be expected the Waimea Plain and the lowlands of the Motueka River Basin first attracted their attention. Land there was grassed and cultivated for cereal and other food crops. The initial settlement of the Takaka Plain and flat land in the Collingwood district soon followed and the discovery of gold at Collingwood in 1857 gave considerable impetus to the development of these districts. It was not until the 1860s that settlers turned their attention to the high inland country; about that time several grazing runs were taken up in the Murchison district.

Settlement progressed quickly on the alluvial flats, though there was one large area where progress was slow and difficult. This area, known as the "Moutere gravels", has always proved a problem one and only during recent years have renewed efforts been made to convert some of these soils into farming land. The formation, which comprises a vast deposit of gravels, silt, and sand, covers about 360,000 acres and extends from Lake Rotoiti in the south to Mapua and Tasman on the shores of Tasman Bay, a distance of approximately 40 miles, and the







[Photograph at upper left by V. C. Browne and lower right by National Publicity

Upper left—The City of Nelson, with a population of about 18,500, is the servicing town for the district which comprises the Counties of Waimea, Takaka, Collingwood, and Murchison. Upper right—To get to Takaka and Collingwood from Nelson involves a long drive over a 2600ft. hill which until recent years, when roads have become better, was avoided if possible. Lower left—Waikoropupu Springs, in the Takaka district, from which come 400 million gallons of water per day. They form the source of a tributary of the Takaka River. Lower right—The township of Takaka. The Waimea and Takaka Plains are the two main areas of flat land in the Nelson district, in which it is estimated that not more than 3 per cent. of the land is flat. On the Waimea Plain dairy farming, fat lamb production, vegetable growing, and pip and stone fruit growing are all practised. On the Takaka Plain the main activity is dairying for supply to the local dairy factory, which has an annual output of about 950 tons of butter.

average width of the formation is about 12 miles.

The first recorded settlement of the Moutere gravels was by German settlers at Upper Moutere in 1844-45, but they experienced considerable difficulties because of the poor soil. Other attempts at settlement were made, not always successfully, and those who had endeavoured to create farms wondered how they could continue using these soils. This is illustrated by an interesting letter written to the "New Zealand Farmer" in September 1900 by a prominent farmer at Lower Moutere. The letter reads:—

Inspectors Clifton and Fleming of the Auckland district in their report for 1898-99 give short accounts of successful gorse growing for sheep, which reports have caused a good deal of interest among farmers here. We have in this district thousands of acres of poor clay rolling hills overgrown with manuka scrub, and valued in their unimproved state at 6s. per acre. The land will not grow the better grasses but only poor stuff, and there is continual expense from the persistent way in which manuka comes from seed. Several of us have determined to give the gorse a trial. We have had sufficient experience of it as a nuisance and, therefore, wish to know all we can before starting. With this in view I shall be glad if you will give some information on the following points:—

(a) Whether it is the common gorse and if so how it is usually gathered.

(b) The quantity of seed per acre to be drilled in rows 6in. apart.

(c) The height of the plant before it can be grazed.

(d) How it is cut for winter feed or chaffing.

(e) The expense of a machine for rolling (to crush spines) and where it can be obtained.

(f) The cultivation which is necessary between the rows.

(g) The advisability of sowing grass between the rows.

This was probably the forerunner of what has become known as gorse farming in Nelson. Gorse has been sown and even today there are farmers who are strong advocates of its usefulness on the Moutere hills.

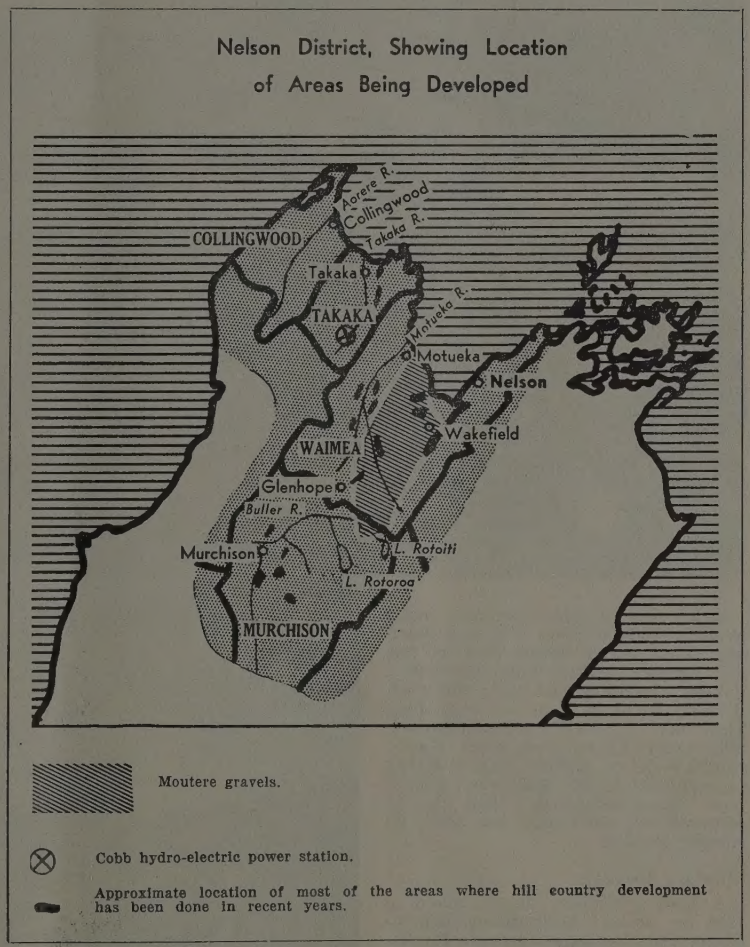
Though the greater part of the Moutere formation has been regarded as a problem area, the section skirting Tasman Bay and known provisionally as the Mapua clay loam has proved to be a good pip fruit growing area. In 1911 the first block of this land at Upper Tasman was subdivided and planted in apples. Today there are approximately 2500 acres in apples and pears on this coastal fringe and about two-thirds of the Nelson pip fruit crop comes from the area.

It has also been found that pine trees flourish well on these gravels and there has now arisen a conflict of interests between those who advocate the use of the area for afforestation and those who consider that much of the land should be converted to pasture.

Land Development

Though there are still problems to be overcome on some of the flat areas and valley floors, such as adequate drainage of parts of the Takaka Plain and Aorere Valley, before the areas attain high production, it is from some of the hill country and the Moutere gravels that Nelson will have to look for much of the increase in primary production before the district can hope to attain its full economic stature. The hill areas where increased production is likely to be obtained can be divided broadly into four sections:—

1. Takaka hills.
2. Moutere gravels.
3. Nelson hills.
4. Hill terraces of Murchison district.



Takaka Hills

To the east of the Takaka Plain there is an area of 30,000 to 40,000 acres of hill country much of which can be improved by oversowing and topdressing by aircraft. Part of this area comprises steep faces, but some farmers are carrying approximately 1½ ewes per acre and it is estimated that carrying capacities of 2½ to 3 ewes per acre can be achieved over part of the area.

The 1953-54 season was the first in which aerial topdressing was done in the Takaka district; in the 1954-55 season approximately 200 tons of phosphates were spread by air on this hill country. Costs are fairly high, owing mainly to the cost of superphosphate (approximately £14 per ton) at Takaka. One farmer who topdressed 200 acres of his hill country this season incurred an all-in cost of approximately £1 17s. 6d. per acre to spread 2cwt. of superphosphate. This included the cost of fertiliser landed on the airstrip, labour provided by the farmer to assist with loading the aircraft, and the aircraft spreading cost.

So far few attempts have been made to clear and cultivate and sow down any of the easier rolling parts of this hill country section, but there is a notable exception, that being the work done by Mr. R. H. Ryder, of Ligar Bay, Tarakohe. Practically all of his cultivable land has been sown down to good ryegrass-clover pasture and carrying capacities of 4 ewes and over per acre have been achieved. This is an example of what can be done on similar country.

Moutere Gravels

A land utilisation survey made in 1950 by several Government departments and Cawthron Institute for the Nelson Catchment Board showed that there was approximately 315,000 acres of Moutere gravels within Waimea County, the balance of approximately 50,000 acres being in Murchison County. Information on the cover of the area in Waimea County is set out in the following table.

ACREAGES OF DIFFERENT CATEGORIES OF VEGETATION ON MOUTERE GRAVELS IN WAIMEA COUNTY

	Acres
Improved pasture and cultivated area	44,000
Native pasture (clean)	15,000
Pastures partly reverted:	
Slight to moderate	25,000
Moderate to bad	54,000
Fully reverted	82,000
Native bush	47,500
Exotic plantations	45,000
Orchards	2,500
	315,000

After allowing for the area in native and exotic forests and some reverted land which was considered unsuitable for farming mainly because of its

[*Photographs on this and opposite pages by Ellis Dudgeon*

1—Looking across orchards to the Moutere hills property being developed by Transport Nelson Holdings Ltd. 2—The first stage in breaking in is to crush and cut the manuka, gorse, etc., with giant discs. The area is then left for a time, after which the vegetation is burnt. The area is then again giant disced. 3 and 4—After the second giant discing the area is worked down with tandem discs and heavy chain harrows preparatory to sowing to lupins.

steepness a special committee of the catchment board considered that there were 148,500 acres of Moutere gravels within Waimea County which should be retained for farming. The cover on this land was as follows:—

	Acres
Improved pasture and cultivated areas	44,000
Clean native pasture	15,000
Pastures showing slight to moderate reversion	25,000
Pastures showing moderate to full reversion	62,000
Orchards	2,500
	148,500

On the basis of these figures it is reasonable to assume that of the total area of 360,000 acres of Moutere gravels, 150,000 to 155,000 acres are suitable for farming. The deteriorated country has a mixed cover; there are gorse and manuka, bracken fern in places, and seedling pine trees and there are also considerable areas of Spanish heath.

Generally the land held by farmers is used to graze sheep, and estimates give the average carrying capacity of the area used for farming as one dry sheep to approximately 4 acres; yet there are some farmers who through their enterprise are carrying about 4 ewes per acre. The methods adopted by the land improvers to bring in this manuka-, gorse-, and heath-infested Moutere hill country vary.

Eves Valley

One of the pioneers, Mr. A. T. Palmer, of Eves Valley, advocates an initial ploughing with a heavy swamp plough, which turns under the vegetation, this being followed by two discings and the use of heavy harrows. A root crop is taken before the area is grassed.

88 Valley

A somewhat similar method of cultivation is adopted by two other pioneers, Mr. T. Hunt and his son John, of 88 Valley, Wakefield, but instead of a crop being sown, the area when worked is put straight to pasture. Two tons of lime and nearly 2cwt. of superphosphate per acre are applied at sowing down and the pastures are top-dressed every other year with 1½cwt. to 2cwt. of superphosphate per acre. The large swamp plough used by the contractor who does Mr. Hunt's ploughing turns a furrow 2ft. 6in. wide and 10in. deep. All subsequent cultivation is done with Mr. Hunt's equipment. Mob stocking is the practice and carrying capacities equivalent to 4 ewes and over per acre are the order on the farm. The Hunts' stud Romney ewes are highly sought after and are now well known to some sheep farmers on the east coast of the North Island.

In reminiscent mood Mr. Hunt senior said: "I can recall 30 odd years ago

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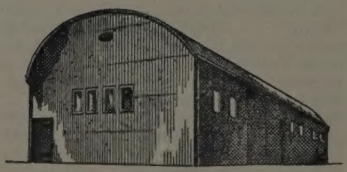

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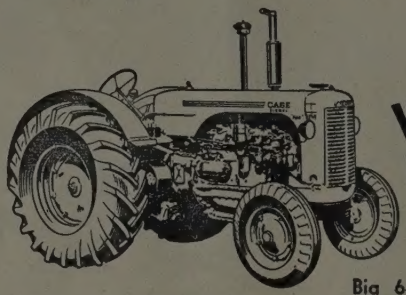

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Gorse farming in Nelson district. In the past gorse has been sown on the Moutere gravels for sheep feed and even today there are farmers who contend that it is useful on this country.

while riding my horse through a sea of manuka scrub and gorse trying to visualise what the country would look like if in pasture similar to some in one of our alluvial valleys. Little did I realise that in my lifetime the transformation would take place. The results achieved on our poor clay country have exceeded all my expectations."

In 88 Valley are two other farmers who have been hard at work for some years in transforming this hill country. On the "Punawai" property of Messrs. D. C. Parkes and Sons the initial operation is to burn as much as possible of the standing scrub and gorse and to crush the remainder with a tracklaying tractor with a bar in front and drawing a set of giant discs. After a few weeks the chopped-off gorse is fired and during winter the area is ploughed with a heavy swamp plough. The land is then broken down with giant discs followed by lighter discs and harrows and sown to lupins, which provide winter feed for the ewes. After feeding off, the land is again worked and sown to rape, after which the final working is done for pasture. The usual pasture mixture comprises 1½ bushels of perennial ryegrass, 5lb. of cocksfoot, 2lb. of white clover, 2lb. of subterranean clover, and 4lb. of red clover. At sowing down the area receives 1½ tons of lime and approximately 2cwt. of superphosphate per acre. Improved areas carry 4 ewes per acre in contrast to a carrying capacity of about ½ sheep per acre in the unimproved state.

Though he did use the swamp plough, Mr. C. F. Shuttleworth, a neighbour of Mr. Parkes, now begins his breaking in with giant discs. After the land is worked down ryecorn is sown, which gives a quick cover and helps to prevent erosion. After feeding off, the ground is worked again and sown to pasture, the usual mixture comprising 1½ bushels of perennial ryegrass, 5lb. of short-rotation ryegrass, a little cocksfoot, 3lb. of white clover, and 4lb. of subterranean clover. With the ryecorn about 1½cwt. of superphosphate per acre is used and before sowing of pasture 2 tons of lime per acre is applied and at sowing down another 3cwt. to 5cwt. of superphosphate per acre.

Further inland on higher country at Glenhope there is another Moutere land improver, Mr. Newton McConochie, who is well known to many of the servicemen settled on the land in Nelson. His country was formerly under heavy beech forest and the removal of the remaining timber is an added cost in bringing in some of it. Mr. McConochie is now carrying 3 ewes per acre on his improved country and in his development programme he provides for a summer and winter fallow, after which the land is sown to a root crop. This is fed off in winter and the area is sown to pasture in spring.

Redwood Valley

There are other Moutere land improvers scattered throughout the area, but there are two recent development projects which are attracting considerable attention. A little less than 12 months ago Transport Nelson Holdings Ltd. took up the lease of a property of 2225 acres in the Redwood Valley district which they are now developing. Up to the end of March 650 acres had been double disced for the first time and of this area 265 acres had been fired, double disced again, harrowed twice, and sown to lupins. This is a large development project being handled in an efficient manner and it demonstrates the faith in this country by this large organisation.

The other area is that being developed as a demonstration farm by the Soil Conservation and Rivers Control Council. The development procedure is along lines somewhat similar to that of the previous case. An area of 230 acres covered in manuka, gorse, heath, etc., was crushed and cut with giant discs and was left for a month to dry out ready for burning. After being burnt the area was worked down with giant discs, light discs, and heavy chain harrows, and lupins and oats were broadcast, the lupins at 2 bushels and the oats at ½ bushel per acre. Before the lupins were broadcast 1 ton of lime per acre was spread with a bulk topdresser.

Detailed costs have not yet been completed, but it is estimated that to

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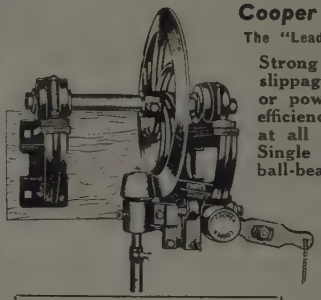

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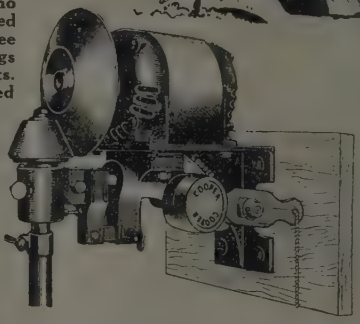

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Some of those developing Moutere hills soils advocate an initial ploughing with a heavy swamp plough. This is an area of manuka- and heath-infested country on Mr. Hunt's property, 88 Valley, which has been ploughed with a heavy plough.

break in the land and get it sown to lupins has cost approximately £10 per acre.

Development Problems

There is no doubt that the development of this country presents many problems. The soils are deficient in lime and phosphates and are low in potash and certain trace elements. Much or the area is steep, about 35 per cent. comprising slopes over 23 degrees, and the relative smallness of workable blocks adds to the cost of breaking in the country. There is not much flat land in valley floors which can be worked in with hill areas and the provision of water is a problem in many parts.

Tracklaying tractors and heavy machinery in the form of swamp ploughs and giant discs are necessary for the initial breaking in of this country, and the provision of this machinery is beyond the financial capacity of most of the Moutere land owners, and even to have the work done by contractors requires finance which many are unable to provide or raise from lending institutions. Costs are high. To have the land broken in and worked up ready for a fodder crop may involve approximately £7 per acre, and by the time it is in grass the cost may be between £15 and £20 per acre. To provide access tracks with a bulldozer will probably work out between £3 and £4 per chain and fencing will be £7 to £9 per chain. These are only a portion of the costs that must be incurred, but they are an indication of some of the initial expenditure.

However, these problems and limitations are not deterring some individuals and organisations from converting this so-called useless country into good pasture. If primary produce prices remain near their present level and there are others with the spirit of the present land improvers, the development of the country will continue. One improver said: "Once the job of breaking in this so-called useless land gets in the blood you cannot leave it alone".

Nelson Hill Areas

To the east of the Waimea Plain there is a stretch of hill country approximately 14 miles long and an average width of 1½ miles comprising about 12,000 acres known as the Heslington soils, which are used extensively for growing early potatoes and peas. Some farmers along these hills are carrying out pasture improvement by oversowing, liming, and the application of phosphates. This country is cleaner, more fertile, and easier to bring into pasture than the Moutere gravels. Also to the west of the Moutere formation, in the Ngatimoti and Thorpe districts, are areas of rolling to steep country on which the fern and scrub have been burnt and the areas oversown quite successfully, and this improvement work is extending.

Murchison Valleys

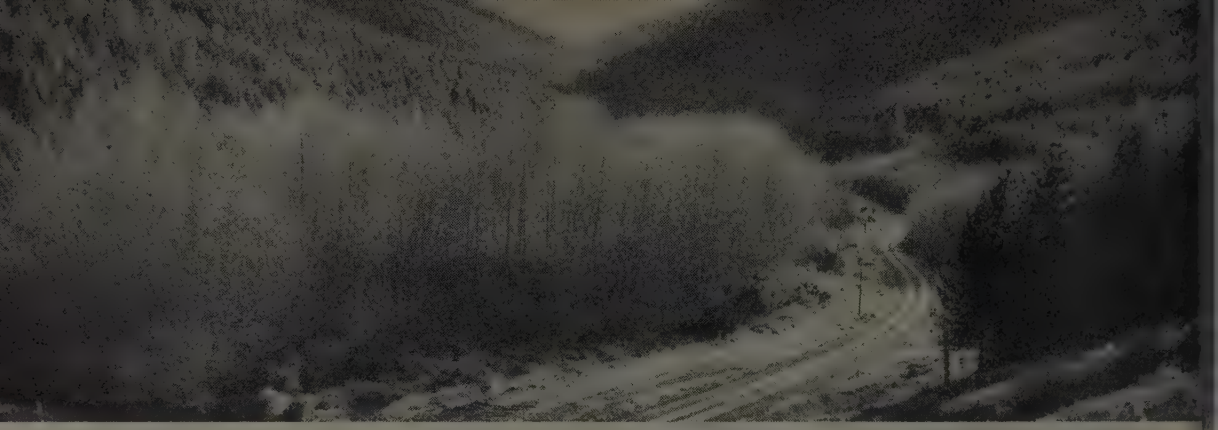
On the terraces and some of the hillsides of the Murchison valleys, such as the Matiri and Tutaki Valleys, considerable success has been achieved by some land improvers in converting some of the stump- and log-strewn country infested with fern and blackberry into good pastures. There is also a farmer in this district who securely fences off areas of about 30 acres of fern-infested country and uses pigs as the primary cultivators.

Most of the terrace land and hill development has been done by farmers who have areas of flat land in the valleys and it is likely that as other farmers attain high production on the flats they will turn their attention to the hill areas.

Softwoods or Sheep

With large areas of the Moutere gravels not being effectively used for farming, areas have been acquired by private interests for planting to pines, and during the depression years of the 1930s the State also planted large areas. As it has been found that the Moutere gravels are suited to the growing of *Pinus radiata* and there is a considerable demand for softwoods, private interests are still purchasing areas for afforestation and there is now arising a conflict between farming and forestry interests.

At present there are approximately 50,000 acres of exotic forests in the Nelson district, practically all of the area being on the Moutere gravels. About 25,000 acres belongs to the State and the remainder is privately owned. About a third of the State forests comprise *Pinus radiata*, and there are 6800 acres in Corsican pine, 3100 acres in western yellow pine, and 2400 acres in Douglas fir. Virtually the whole of the private plantations comprise *Pinus radiata*.



[*New Zealand Forest Service*

Above—Part of the Golden Downs State forest. During the depression of the 1930s the State planted two areas of the Moutere gravels in trees, Golden Downs (25,000 acres) being the larger. About a third of this area is *Pinus radiata*; other varieties include Corsican pine (6800 acres), western yellow pine (3100 acres), and Douglas fir (2400 acres). Below—Pines regenerating in a cut-over plantation on the Moutere gravels. Some of the privately owned pine plantations are being milled and the export of softwoods from Nelson is assuming considerable economic importance.

There is no felling in the State plantations except thinnings, which are used for box making, but considerable areas of the private plantations are being milled and the export of softwoods from Nelson is beginning to assume considerable economic importance. The following are timber exports from Nelson:—

	1953 super. ft.	1954 super. ft.
Overseas	1,403,000	2,529,000
Coastal	514,000	1,916,000
	1,917,000	4,445,000

The value of the timber exported in 1954 was probably about £400,000. In addition to the exports all of the cases required for the fruit and vegetable crops are made up in the district from locally grown timber. For the 1954-55 season the fruit and vegetable crops required approximately 1¾ million cases. In addition the local building industry uses about 6 million superficial feet of exotic timber per annum.

Hydro-electric Development

The only hydro-electric scheme in Nelson is the Cobb River station, situated about 24 miles inland from Takaka (see cover). Water is drawn from a dam across the Cobb River and this is led through a tunnel and pipeline to the power station, which is alongside the Takaka River.

The station, which has a capacity of 12,000 kilowatts, was begun by a private company, but the project was taken over and completed by the Government. It began supplying power to the Nelson district in June 1944 and to Marlborough in January 1945, but with the growing demand for power its capacity is being extended to 32,000 kilowatts and this work is nearing completion.

Another scheme known as the Braeburn project was proposed and preliminary investigations were completed. The proposal envisaged leading water from Lake Rotoroa by a 6-mile tunnel to the Tutaki Valley, where the power station was to be located. Recently the Government decided to postpone construction of this scheme and a transmission line will now be built from Christchurch to supply the Nelson-Marlborough area. It is considered that the needs of these districts will be met more quickly and economically by this means than by the construction of the Braeburn project.

The Future

It is estimated that approximately 10,000 acres of rolling and hilly country in the Nelson district have been developed and improved in recent years, and the development work is continuing. Forestry interests are also increasing their areas in softwoods.

The district complains of its isolation, but with the extension of the land improvement work and afforestation and the consequent increase in primary production this isolation must eventually become less apparent, for increasing production will inevitably be followed by improved transport facilities with other parts of the Dominion.

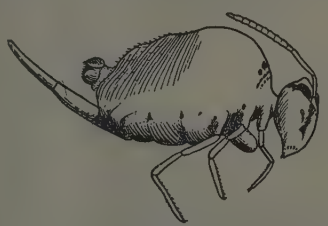
For sound economic development the claims of farming and forestry for the land resources of the district must be reconciled and there appears to be no reason why this should not occur, as there is ample land for both purposes. The district also has much to offer the visitor. The beaches of Kaiteriteri and Pohara are becoming well known, there is ample shooting and sea and river fishing, and Lake Rotoiti in its mountain setting is proving a popular summer resort. In winter there is skiing on Mt. Roberts alongside this lake and also in the ranges to the south-west of Motueka. The better transport which will follow increasing primary production will bring still more people to these playgrounds.

Distribution and Control of Springtails in Cruciferous Crops and Pastures

By J. W. CLELAND, Entomological Research Station, Department of Scientific and Industrial Research, Ashburton

IN the season 1953-54 there were numerous losses of rape, chou moellier, turnips, and kale soon after the crops appeared through the soil surface. Large areas were involved; some sowings were completely destroyed and others were thin and patchy. Normally, damage done to crucifers from early November to mid-December is claimed by the farming community as being caused by adults of the common grass-grub (*Costelytra zealandica* White), but on this occasion few beetles were evident. Close examination of crops revealed very high populations of springtails. The three commonest species were identified as *Bourletiella hortensis* Fitch, *B. arvalis* Fitch, and *B. arvalis* subspecies *dorsobscura* Salmon.

THESE primitive, wingless insects belong to the order *Collembola*, and are minute, measuring between 1/40in. to 1/25in. when fully developed. Some species are black, bluish, or purple; others range from greenish yellow to yellow or orange. A characteristic is their sudden leaping, a



[*Department of Scientific and Industrial Research*
A crucifer springtail.

movement caused by the release of a spring-like appendage which is held beneath the body; when released this appendage strikes the surface on which the insect is resting, thereby causing the springing motion.

Distribution

A survey made throughout Ashburton County showed that springtails were present in fairly high numbers and frequently caused significant damage in a wide range of crucifer crops. They were also causing serious damage in turnip and swede crops in the Kerikeri district, Bay of Islands, in chou moellier around the Hunterville district, and in pasture in the Taihape area. Pasture showed little signs of damage, but it provided a suitable breeding ground between crop seasons.

Population and Symptoms of Damage

The smallness and quick movements of the insects made it somewhat difficult to obtain accurate counts of populations, but counts ranging from 600 to over 900 per square foot were made. As few as 20 springtails per square foot evenly distributed over a paddock of germinating crucifers were found to do significant damage. Injury began immediately after the shedding of the seed shell and before the cotyledons opened. The stems supporting the cotyledons were often damaged before the cotyledons appeared above the ground. The damaged stems may be likened to seedling shoots that have been nipped by birds, the cotyledons being totally removed, only the bare stems being left. Cotyledon and fourth-leaf-stage damage appeared first as slight scalloping on the leaf edge or as small pits or shot-hole effects in the leaf. Damage increased with amazing rapidity, and when large populations of springtails were present cotyledons were completely destroyed within 24 hours; if cotyledons were destroyed before the fourth leaves appeared, the plant died. After the plant passed the fourth-leaf stage, growth generally was so rapid under suitable climatic conditions that only populations above 500 per square foot caused noticeable damage. In some cases, however, where plants received a setback in growth due to climatic conditions a comparatively small population caused severe damage beyond the fourth-leaf stage.

Control

The field in which most of the experimental work was done had been sown down in rape and turnips with short-rotation ryegrass and clovers. The crucifers were being damaged at the time the initial experiments were being laid down.

Two insecticides were applied in the form of sprays, a tractor-drawn trailer sprayer being used. The rates of application of insecticide were ½lb. of para para isomer D.D.T. (a 50 per cent. p.p.i. wettable powder being used) and ½lb. of gamma isomer lindane (based on a 16 per cent. g.i. wettable powder), each in 100 gallons of water per acre. To secure adequate wetting it was necessary to add a wetting agent in the form of a commercial detergent to the D.D.T. suspension at the rate of ½ pint to 100 gallons, but not to the lindane preparation. With both D.D.T. and lindane one application was compared with two applications; in the two-application treatment the interval between sprayings was 7 days, 0.72in. of rain having fallen in the intervening period.

Post-treatment counts of springtails showed that there was little reduction in population on the D.D.T. treatments when compared with that in the untreated area; almost 100 per cent. control was achieved on lindane treatments at both rates of application.

On present prices lindane at the above rates would cost 15s. to £1 for one application and 30s. to £2 for two applications per acre. It is hoped that after further work has been done on this pest the dosage may be reduced. The cost of treatment must be kept low, as it is highly probable that the crop would have to be treated later for the control of white butterfly, diamond-backed moth, crucifer weevils, or aphides, probably involving additional costs of approximately 15s. to 20s. per acre.

[*Department of Scientific and Industrial Research*
A crucifer seedling showing scalloping of leaf edges and damage of leaf surfaces.

Acknowledgments

The writer is indebted to Dr. J. T. Salmon, of Victoria University College, for identifying the *Collembola* concerned; to Mr. J. M. Kelsey for his assistance in the experiments and advice; and to Messrs. R. J. and Lester Tarbotton, of Tinwald, for drawing attention to this problem and for their assistance.

South Island Farmers' Conference at Lincoln

By G. J. NEALE

BETWEEN 400 and 500 farmers attended sessions of the 5th Lincoln College Farmers' Conference at Canterbury Agricultural College, Lincoln, on 18, 19, and 20 May. Lack of accommodation necessitated the restriction of attendances to 200 in the four previous years the conference has been held, but the new refectory block opened at the College last November was able to be used for this year's sessions and the rationing of attendance to restricted numbers from branches of Federated Farmers was abandoned.

THE resultant greatly increased attendances must have been heartening to the College authorities and the conference committee, and the Lincoln Conference seems assured of attaining in the South Island the importance attached by farmers in the North Island to similar conferences at the Department of Agriculture's Animal Research Station at Ruakura and Massey Agricultural College's Sheep Farmers' and Dairy Farmers' Weeks.

The holding of the Lincoln conference during the College vacation enables the offering of residential privileges to visiting farmers, and about eighty "lived in" at this year's conference.

The increasing tendency for agricultural research organisations to encourage periodical visits of farmers to see how the research work was being done and to discuss farmers' individual problems was referred to by the Minister of Agriculture, Mr. Holyoake, in his opening address to the conference. "Today there is a big demand for information on scientific developments so that they can be given practical application. It is good to see the increase in the visits to research institutions and to see farmers turning up in ever-increasing numbers."

"It is fitting," said Dr. M. M. Burns, Director of the College, in welcoming farmers to the conference, "that the first major conference in the new refectory hall, used recently for the 75th anniversary celebrations of the College, should be a South Island farmers' conference. The conference serves as a forum for farmers, but we at the College get as much from you as you get from us."

In referring to the "knotty problems on the hands of farmers at present" in the South Island, the president of the conference, Mr. J. S. Hunt, Hawea, in introducing Mr. Holyoake, mentioned the school of thought that considered that all land above 2000ft. should be abandoned and stock taken off it. This attitude he thought defeatist and entirely wrong, as the tussock grassland carried the sheep in summer that were wintered on the lower levels.

Future of High Country

The future of the high country was recognised by the Government as a subject of deep concern to South Island farmers, said Mr. Holyoake. Many of the problems of the utilisation and management of the high country were peculiar to high country farming, and he felt that their solution would depend to a large extent

←Top—Light refreshments during daily sessions were provided in marquees in the College grounds. Middle—The new refectory block, use of which for conference sessions made it possible to lift restrictions on attendance. Bottom—Part of the attendance at a conference session. R. C. Blackmore photos.

↓Left to right—Mr. W. H. Gillespie, M.P., chairman of the College Board of Governors, Mr. K. J. Holyoake, Minister of Agriculture, Mr. J. Hunt, chairman of the conference, and Dr. M. M. Burns, Director of the College discuss the conference programme. "Star-Sun" photo.

on the discussions at conferences of the type of the Lincoln Farmers' Conference. There was a more enlightened and inquiring frame of mind among farmers today, and it was as evident among high country farmers as among farmers elsewhere.

"I see grounds for optimism in this pooling of farmers' knowledge with that of the plant breeder, soil conservator, agrostologist, and animal nutritionist. I would like to think that just as aerial topdressing has in recent years opened up a new horizon on much of our problem hill country," he said, "so in the not too distant future the tide of deterioration in the high country will be turned and a new era of improvement be embarked on. A great deal of knowledge is possessed both by those who are using this country and by research workers who have its improvement at heart, and with the ever-increasing knowledge of plant and grazing animal relationships, a time must come when the problems will retreat before the weight of knowledge and its concerted application."

Irrigation

Irrigation, which he himself had used extensively on a farm in Nelson years ago, was fairly obviously the source from which any worthwhile increases in production on the large low-rainfall areas east of the Alps in Canterbury and Otago must come, said Mr. Holyoake.

The Government had recognised the importance of irrigation by setting up a standing interdepartmental committee in Wellington to advise it on policy and to report on proposed new irrigation schemes, and there were local committees in Christchurch and Dunedin to examine schemes submitted by groups of farmers through District Commissioners of Works.

"The initiative for the establishment of new irrigation schemes or the extension of existing schemes has been thrown over to the farmers themselves by the Government's policy on irrigation announced this year. The machinery has been set up for expeditious and sympathetic consideration of any new irrigation schemes," he said.

What he had seen and heard of results at the Department of Agriculture's Irrigation Research Station at Winchmore had greatly impressed him, said Mr. Holyoake. The possibilities of dairying on light Canterbury land had been conclusively proved at the Station, and serious consideration was now being given to starting a study of beef production under irrigation. He referred to the paper to be given to the conference by the officer in charge of the Station, Mr. G. K. McPherson, whose report to him on his recent visit to Australia indicated that there was much he had seen of irrigation practices in the very low-rainfall areas there that could be used or adapted with great advantage in South Island areas where irrigation water could be applied.

High Production Farms

Mr. McPherson's paper was one of a series on the management of farms with a high per acre production which was introduced by Dr. P. D. Sears, Chief Pasture Ecologist of the Grasslands Division of the Department of Scientific and Industrial Research, who spoke on the management of high-producing pastures. In a fat lamb trial on 27 acres of irrigated pasture at Winchmore from 1949-50 to 1954-55 ewes carried per acre had been raised from 3.3 to 7.0, lamb meat per acre from 116lb. to 257lb., and wool per acre from 47lb. to 72lb.

Farmer experiences in this series were given by Mr. A. Henderson, Invercargill, Mr. C. A. B. Pilbrow, Coldstream, and Mr. B. H. Palmer, Lochiel.

Lucerne

That tests should be made of the possibilities of creeping lucernes for grazing pastures on light land, a project that was in hand at Lincoln, was the conclusion made by Mr. C. E. Iversen, of the College staff, in his paper "Developments in Lucerne Overseas and their Possible Application in New Zealand", which introduced a series on the place of lucerne in South Island farming.

The increasingly important part played by lucerne in the management of the College's Ashley Dene light land farm was described by Professor A. H. Flay, and Professor J. W. Calder discussed the College's experiences with lucerne and lucerne-grass-clover mixtures.

Farmer contributors to the series were Mr. B. J. Kennington, Seddon, Mr. J. M. Walsh, Blenheim, Mr. E. C. Topp, Waipara, and Mr. R. M. Robertson, North Otago.

Wool

A paper by Mr. B. H. Trolove on the Wool Board and its policy introduced a series on wool production in the South Island, which included others on the wool trade (Mr. J. Boyd-Clark), the value of statistics in the wool industry (Mr. B. Philpott), wool faults (Dr. A. E. Henderson), and the changing pattern of wool production (Mr. F. L. Ward). Farmers' papers on the production of wool were given by Mr. A. A. Urquhart, Mt. Somers (Merino), Mr. C. G. Cran, Bayfields (half-bred), Mr. C. H. Bethell, North Canterbury, and Mr. G. T. Askin, Ealing (Corriedale), and Mr. J. Clark, Tussock Creek.

Open Forums

Members of the College staff constituted panels on two evenings of the conference to answer questions and discuss subjects in the informal atmosphere characteristic of these conferences.

Future Conferences

The inclusion of papers of interest to dairy and beef producing farmers in future conferences was requested at a business meeting that closed the conference. A proposal to include a field day was carried with a large majority and half a day is to be spent on Ashley Dene next year.

"Microbes and Us": Hugh Nicol

HUGH NICOL is well qualified to write a book of this nature. He has been assistant bacteriologist at Rothamsted Experimental Station, England, and is now Professor of Agricultural Chemistry at the West of Scotland Agricultural College. His earlier success in the field of "popular" science was "Microbes by the Million", and "Microbes and Us" should help to secure his reputation in this field.

The subject matter of "Microbes and Us" is considerably wider than the title would indicate. It embraces many branches of agricultural science, with particular emphasis on soil science. The microbes Hugh Nicol talks about are soil microbes, and he stresses our dependence on soil life. The author is even more concerned, however, with the natural resources of fuel and the demands that the present and likely future levels of food production will make on dwindling fuel supplies. Many of his conclusions with regard to this food and fuel problem merit close study.

The book is written in a popular style, but assumes a fair knowledge of chemistry from the reader. Though the chapters on agricultural chemistry and plant physiology are necessary for the full development of the author's argument, the casual reader might be discouraged on meeting these more difficult sections early in the book. This would be a pity, for a book of this nature deserves a wide reading public.

"Microbes and Us" can be recommended to all persons interested in problems of food supply. The remarks on the present inferior place of agricultural science among the applied sciences and the reasons advanced for the injustice of this will be read with interest by all who are endeavouring to give the science of agriculture the prominence it deserves.—*P.B.L.*

Penguin Books. 1955.

Deep-litter System for Commercial Egg Production in Britain

IN the second article on poultry husbandry in Britain in the April issue of the "Journal" F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington, referred to the intensive systems of management for commercial egg production now popular in that country. Reference was made to the battery cage system of keeping laying birds, a system giving highly satisfactory results. This article describes another system of maintaining layers under intensive conditions, a system that has proved most efficient, particularly for winter egg production.

MUCH has been written in overseas poultry publications in recent years on the subject of "deep litter" or the deep-litter system of keeping laying birds. Considerable interest has been aroused in this subject in New Zealand and it is apparent that there is some confusion as to exactly how this system operates overseas. The deep-litter system was discovered in America, more or less by chance. Labour shortages in wartime led to laying sheds not being cleaned out at the normal season of the year, in spite of which birds laid exceedingly well on the "dirty litter". These unusual conditions and results were studied closely by Dr. D. C. Kennard at Ohio State University and interesting information was obtained. Since then the deep-litter system has been adopted widely in America and is now becoming very popular in Britain.

New Zealand Methods

Deep litter in intensive houses appears to New Zealand poultry farmers to be no new system of management and in fact it is less revolutionary in this country than in Britain. "Deep litter", however, is in some senses a misnomer, as the actual depth of litter is far from being the most important characteristic of this system. Thus poultry producers who build up straw in their laying houses to a depth of say 6in. or even more quite frequently refer to this practice as keeping birds on the deep-litter system. Though it is a fact that this comparatively deep layer of straw gradually breaks up, the pieces of straw getting shorter and shorter as the birds scratch for grain in the litter, rarely is there any extensive bacterial action. Furthermore, during wet, cold weather in winter this straw often becomes excessively damp and wholly undesirable for the birds in the house.

Overseas Practice

Under the deep-litter system as operated overseas there is a planned management of the litter to ensure bacterial action and the maintenance of dry conditions. In practice efficient deep litter means more work in the laying shed, particularly at the start, than is usually required with litter in this country. The deep-litter system is not a new easy or lazy method whereby straw is built up rapidly to an extra depth and left for say 2 years without being cleaned out. Concisely described, deep litter is the planned mixing together of droppings and litter to bring about by bacterial action a fine, dry, "compost-like" material. This may take some months, but thereafter it remains suitable for laying stock for 2 or more years.

This can mean a saving in litter material and ultimately labour. In addition, well-developed deep litter forms a warm "floor" for the birds, which is conducive to comfort and good egg production in winter. Also, where it is successfully established deep litter can prevent wet floors in winter. Finally research has established that the bacterial action produces appreciable amounts of what is referred to as "the animal protein factor" (vitamin B_{12} and other elements) and also riboflavin. These are of importance, as they assist egg production and hatchability.

Suitable Buildings

A wide variety of housing is being used in Britain for this system, but all are similar in having a dry floor, controlled ventilation, walls which conserve warmth, and full-span roofs, preferably not too lofty or alternatively fitted with false ceilings. Thus military-type wooden huts, brick farm buildings, and specially constructed full-span-roofed laying houses are being used for this system. Such housing is not only suitable for maintaining the right conditions for developing deep litter, but it also offers full protection to laying birds during severe winter weather.

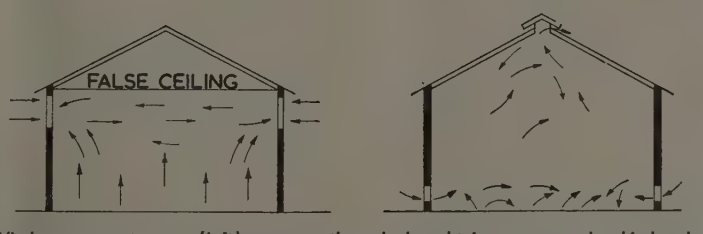
In connection with housing, those who have had experience of this system state:—

1. That wooden and concrete floors are suitable, the latter being rather cooler than wood. A good, dry earth floor is excellent for this system, but it is essential that it be dry and not subject to seepage from any higher, surrounding ground.

2. That the walls may be constructed of any of the normal building materials used for poultry houses. On the other hand to obtain the best results wood, asbestos, or corrugated iron should be lined for insulation. It is probable that a well-built wooden house in New Zealand would make a satisfactory deep-litter house without insulation.

3. That the roof should **not** be too high or lofty. More heat is lost in the span of a high roof than would be lost because uninsulated walls were used. The roof should therefore be insulated, and glass windows in the roof are not recommended. The most satisfactory method appears to be the construction of a false ceiling about 8ft. above the floor. If this is fitted, the roof above does not need to be insulated.

4. That controlled ventilation is essential. Adequate ventilation to ensure a constant change of air is an important feature of any deep-litter house. It is claimed that this may be obtained by the use of ordinary sash windows **placed immediately under the eaves**. The principle of taking in air through windows near floor level and exhausting stale air through ventilators at the ridge of the roof is stated to be entirely wrong and conducive of wet floors from condensation. Sash windows are for ventilation and for providing light for the birds. It has been computed that sufficient light and ventilation is given in a full-span house if window space equivalent to



Windows open at eaves (left) ensure a through draught in summer and unhindered ingress and egress of air. With bottom-to-top ventilation (right) cool air meets warm moist air and cools and condenses it; the moisture then drops into the litter. Air that does rise is cooled in the cooler roof and a lot of the resulting moisture falls back.

5 to 7 per cent. of the wall area is provided. Thus a house 50ft. long and 8ft. to the eaves would need 20 to 35 sq. ft. of window on each wall. This could be obtained with five windows, each 3ft. wide by 2ft. 6in. deep, on each side of the house. It is recommended that windows on opposite walls be staggered and not be built directly opposite one another. Louvre windows should be suitable for this purpose.

Interior Fittings

Only two important fittings of a laying house need be referred to as being particularly necessary with a deep-litter house. An automatic water supply fitting of a type which prevents as far as possible drops or splashes falling on to the litter is highly desirable. Litter will always tend to be damp and become padded down immediately around the drinkers. Such litter should be removed from the house from time to time.

Generally, fixed perches are not used in deep-litter houses. Where they are fitted it is usual to have a droppings pit which is emptied when necessary. The more common practice is to have perches on an easily moved wooden or metal structure which can be moved at regular intervals to different places on the floor surface, thereby effecting an even distribution of droppings over all the litter. This avoids an accumulation of wet droppings on any particular sections of the litter and ensures that the droppings are widely dispersed and so available for the development of the deep-litter or compost-like material.

Choice of Litter

Suitable litter and its management are the most important factors in the successful development of deep litter.

When litter is being chosen the first essential is its ability to absorb moisture. Its ability to decompose readily and its availability and cost are other matters for consideration. Peat moss is used in Britain, but is not available in this country. It has excellent absorbent and lasting qualities, but has the marked disadvantage of becoming excessively dusty. Sawdust is another excellent material for deep litter, and shavings are good. Whole straw is not satisfactory for deep litter at the start, as it readily mats and will become damp. It can, however, be used once the bacterial action is well under way. Cut straw (1½in. to 2in. long) is superior to whole straw, but is not sufficiently absorbent until after it has started to break down.

Thus shavings and sawdust in equal quantities are recommended as a sound mixture for developing deep litter. A litter composed of 75 per cent. of sawdust and 25 per cent. of straw may be used with every chance of success; the straw should be cut for best results.

Management of Litter

There appear to be two schools of thought on the management of deep litter, particularly at the start. One method recommended is to put into the house 6in. to 8in. of litter right from the start. This is deep litter as opposed to built-up litter, a term more appropriate to the second method, which will be described. Placing almost the full depth of litter from the start can be successful, but it usually takes longer for bacterial action to start as compared with the second method.

The second method or built-up litter consists of putting down about 2in. to 3in. of litter at the start and allowing this to become heavily impregnated with droppings during the first 6 to 8 weeks. At this stage the litter tends to feel damp and contains a high concentration of bacteria and moulds. When this stage is reached a further 2in. of litter is added and the whole thoroughly well stirred up from the bottom. Further litter is added at about fortnightly intervals with further thorough stirrings until a final depth of say 10in. of litter is obtained. Warm areas within the litter will now be found all over the floor, these being areas where the activities of micro-organisms are greatest.

There may be periods during a bad winter when the moisture content of the litter becomes too high and there is a danger of getting wet litter. At such times hydrated lime or finely ground limestone may be added to the litter at 10lb. to 15lb. per 100 sq. ft. of floor space. It may only be necessary to use lime on damp or wet areas and not over the entire floor. This lime does not absorb moisture, but its fine particles stick to the litter, giving it a coating which opens it up, thereby permitting surplus moisture to evaporate more readily. As the main principle of deep or built-up litter is to break down the material and to drive moisture by evaporation into the atmosphere, the need for efficient ventilation to remove this moisture from the house is evident.

Once the litter becomes active and is built up to a desirable depth the aaddition of further litter becomes unnecessary. Bacterial action becomes less noticeable during dry weather.

When it is well established deep or built-up litter may be retained for at least 2 years. It is, however, common practice at the end of a year to remove some of the litter, to heap up the remainder, clean the house, respread the old litter, and then to add fresh litter before housing a new flock of pullets. The old litter becomes an "activator" for the new material, which in turn is broken down.

New deep litter and all additions to old litter for a new flock of birds should be started in late summer or early autumn, in the same way that new litter is built up in poultry houses each year before winter in this country.

"Raising Livestock": G. P. Deyoe, W. A. Ross, and W. H. Peters

"RAISING LIVESTOCK" is a new edition of a standard text book on animal husbandry and is intended primarily for the use of students of agriculture in United States agricultural colleges. It is admirably suited to this purpose, covering in simple language the major features of a standard elementary course in animal production.

Of necessity it deals with the raising of farm animals under North American conditions and in consequence much of the advice given has little application in New Zealand. This is especially true of the sections on feeding, housing, and marketing of livestock. At the same time the book provides a wealth of information on animal management and will undoubtedly be read with interest by the young New Zealander keen to improve his efficiency in the care of livestock.

The book incorporates latest advances in knowledge and shows how these can be inter-married with standard farming practices. Of special interest is the reduced emphasis on stock judging as a method of selecting livestock. This is in keeping with the modern tendency to rely on measured standards of performance rather than eye judgment in the building up of flocks and herds.

The book is extremely well produced and illustrated.

—C.P.McM.

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Top Grafting Established Grape Vines and Bench Grafting Vines

By F. BERRY-SMITH, Viticulturist, Department of Agriculture, Auckland

RARELY is the best selection of varieties made when a vineyard is established, and replacement of unsuitable varieties is a common problem for vignerons. In the first part of this article a new method of replacing varieties, by a top-grafting technique developed in New Zealand, is described. A later section of the article deals with bench grafting of grape vines.

THE most suitable varieties are not always known or available when a vineyard is originally planted or the soil and climate may eventually prove unfavourable for certain grapes. In fact, almost any planting is somewhat experimental until the varieties have been proved by performance in their new habitat. Soil conditions can vary widely in the same locality and some grape varieties are more exacting than others in the environment they will tolerate. It is also sometimes necessary to increase the number of some varieties to meet a demand for popular wine types and, for economic reasons, to reduce the number of those producing less popular wines.

It is unfortunate in some respects that the various grape varieties are mostly specific in their application to wine type. However, if it were otherwise and most grapes were in a general-purpose category, viticulture and wine making would lack scope and interest.

Replacing Vines

The customary methods of replacing grape vines are to uproot and replant them or to rework existing vines after decapitating them at ground level. Reworking is done by making a cleft graft on the stump or a green graft on a shoot from the stump.

Replanting means loss of production for about 4 years, and even then the replacement vines never do as well as the original planting. Grafting is a quicker way of converting varieties and restoring production. For reworking of vines green grafting is preferable to cleft grafting, being neater and more efficient.

Cleft grafting the stumps at ground level is a slow, inconvenient operation requiring excavation of the soil round the stump to expose it. Usually stumps have a twisted grain and the only way of making a straight, smooth incision for the scion wood is with a fine-toothed saw. The stumps of older vines are too large for one scion, and two grafts, making a double trunk, are undesirable. Many such grafts fail because the amputation and cleft to receive the graft expose a large wound accessible to seepage water and vulnerable to attack from rot organisms and borer.

Whichever way grafting is done the shoots from the grafts require protec-

HEADING PHOTOGRAPH: A 50-year-old vine successfully top grafted. This vigorous growth was made the same season the grafting was done.

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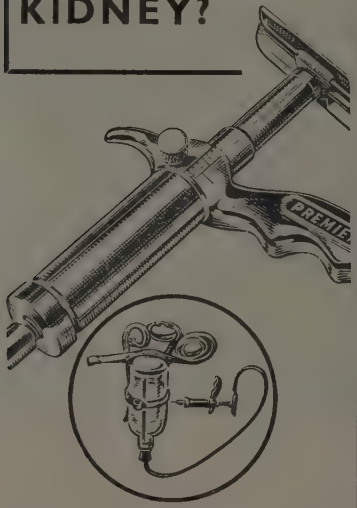

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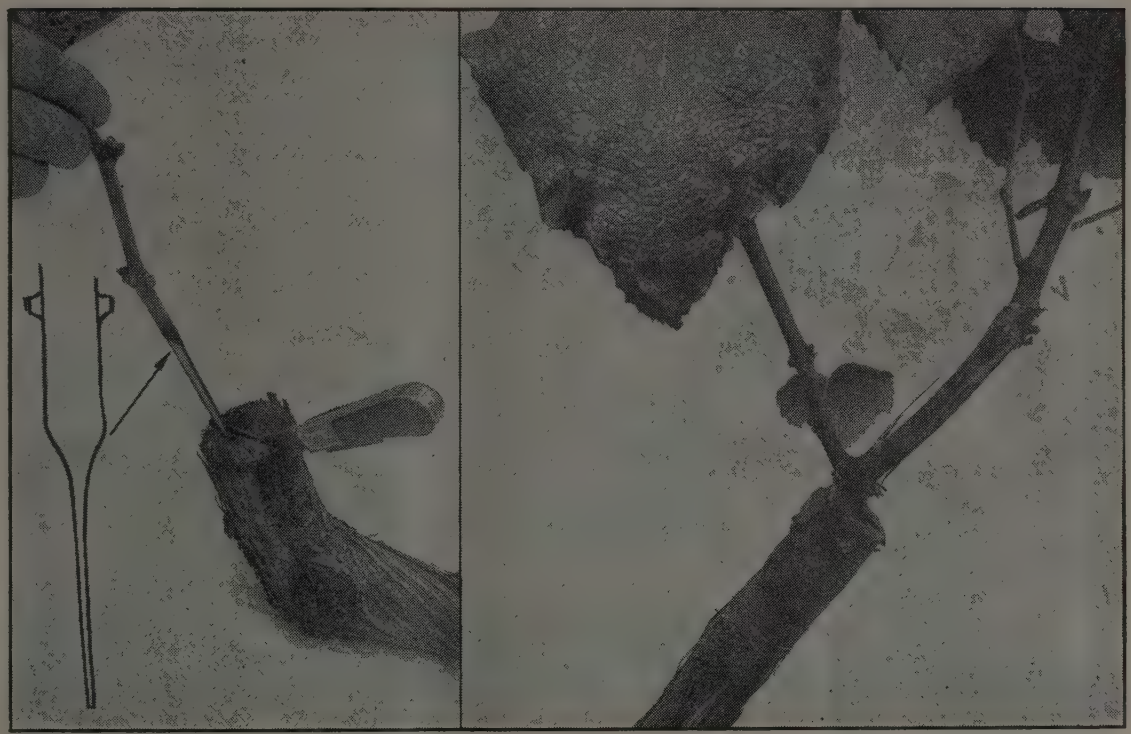


Left—Performing the cleft graft. The cleft is made parallel to the direction in which the trellis runs, and the bottom bud of the scion points outward. The diagram shows the curved shoulders on the scion. Right—Close-up of a single scion graft as it appeared in the autumn after grafting.

tion from cultivating implements and wind damage. They have to be staked or pieces of binder twine have to be fixed from the stumps to the trellis wire to train the growths.

New Method

The shortcomings of the orthodox methods for replacing varieties described has lead recently to the development in New Zealand of an improved technique which has given outstanding results. This new technique is quite simple and essentially consists of performing an aerial or top cleft graft on the vine trunk about 6in. below the bottom wire of the trellis.

The secret of success is the use of insulating tape to bind the graft.

Binding materials such as raffia (with or without grafting wax), waxed tape, and rubber strips proved quite unsatisfactory. Even polyvinyl chloride plastic tape, which has proved useful for grafting a wide range of other plants, was a failure in grafting experiments with grape vines.

Insulation tape has proved ideal for binding aerial vine grafts, because it not only prevents drying out but allows sufficient aeration for callus formation and permits drainage for any excess sap. The other materials mentioned failed mainly because they sealed the graft too effectively from the air and also because they prevented drainage of any surplus sap.

As some aeration is necessary for the formation of callus tissue in grape vines, grafting wax is useless under any conditions. With insulating tape the graft can be very tightly bound, thus ensuring the essential requirement of firm contact of the cambium layers of the stock and scion. The larger reserves of plant food in the vine trunk, as compared with those in the short stump left in cleft grafting, no doubt contribute also to the better results achieved with top grafting.

Best Time for Top Grafting

Top grafting of established vines to other varieties has been conducted successfully in New Zealand from the first week in September to the third week in November as the extreme range. Seasonal conditions, of course, influence the grafting period.

From the writer's experience the most favourable time for this grafting is from about mid-September to mid-October. The scion wood should be taken from the vines in July or early August, cut into lengths of about 2ft. and tied into bundles for easy handling. A convenient way of storing these cuttings until they are required for grafting is to stand them upright in a tub containing about 4in. of water in a cool, dark place in a building or shed. The water will need replenishing during the storage period.

A common method of storing the cuttings is to stack them on the shaded, south side of a building or hedge and cover them with sand. If the buds have begun to move slightly when grafted, this is no disadvantage.

Grafting Procedure

The vine to be grafted is sawn or cut off about 6in. below the bottom wire of the trellis, which permits convenient tying of the young shoots. A sharp, thin-bladed draw knife is a good tool for making the grafting incision in the vine trunk and may be used by being pressed down with a rocking motion or tapped with a mallet.

Depending on the size of the trunk, one or two scions, of two buds each, are inserted. The bark or cambium layers of stock and scion should be carefully matched and the graft firmly and completely bound with insulation tape so that no cut surfaces are exposed.

Frequently the first shoots from the scion advance to a certain stage and then wilt and die, because the knitting of the graft may be incomplete at this stage. Secondary shoots take the place of the ones which have died, if the grafts have been properly done, and progress from then on is rapid. Sometimes even two shoots may die; a third forms, survives, and saves the situation. Such signs are naturally disturbing, but are mostly false alarms, as with reasonable skill and care 95 per cent. of successful grafts can be achieved.

When the wedge-shaped end of the two-bud scion is being cut, the sides should not be made straight all the way, but should start with a curving shoulder (see the illustration on page 21). A longer and better-fitting tongue can be made in this way. A straight-sided wedge because of its much wider top prevents a tight fit at the point when in position in the cleft.

Wood from 1 to 50 years old has been top grafted successfully. That old vines, provided they are fairly vigorous, can be over-grafted satisfactorily to better varieties is shown in the illustration at the top of page 19. Strong vines top grafted one season are often in full production again the following season, resulting in loss of production for one season only.

Results

In New Zealand the vigorous Baco No. 1 variety when top grafted with varieties such as Palomino, Seibel 7053, Seibel 5455, or G.G. 157 has produced 30lb. to 40lb. of fruit per vine from the new varieties the following season. Seibel 5409 has produced fruit almost three times normal size on Baco No. 1 roots and the cropping has been increased appreciably. Where Baco No. 1, which is resistant to phylloxera, has been top grafted in this way (thus serving as a stock), it has often outperformed Mouvedre X Rupestris 1202, the most commonly used stock on heavy clay soil.

Top grafting has been applied successfully to a wide range of other varieties, but reasonable vigour in the vines acting as the stock is a necessary condition. The good top graft of Palomino (Buckland Sweetwater) on 4-year-old Golden Chasselas on 1202 stock shown in the illustration at left below is a typical example.

Top-grafted vine with two scions in the autumn following grafting, showing the strong growth made in one season. The original variety was Golden Chasselas on 1202 stock, aged 4 years. The top graft was made with Palomino.

Above—Baco No. 1 vine top grafted on to Seibel 5409 the previous season. Single-scion grafts of two buds were made on each of the two forked arms. The vine is now in full production, but the crop had been harvested when the photograph was taken. Below—Close-up of the vine illustrated above, showing the grafted unions.

Usually the insulation tape used in grafting deteriorates through exposure to the weather and begins to loosen and unravel after a time; there is therefore no risk of its strangling the graft. It is, however, preferable to remove the tape in autumn, as it may harbour insect pests. Where borer is troublesome any crevices in the graft union should be injected with D.D.T. emulsion when the tape is removed.

Some growers claim results are better if the graft is bandaged with linen tape before the insulation tape is applied. The purpose of this bandage is to absorb excess sap, which can sometimes accumulate, putrefy, and spoil the graft. It appears, therefore, that the absorbent bandage would be advantageous where vines are growing in moist, fertile soil and the flow of sap is very copious; otherwise it is unnecessary.

Bench Grafting Grape Vines

LATE last century when the depredation of the vine pest phylloxera threatened the existence of the European vineyards bench grafting of grape vines was evolved to meet the tremendous demand for grafted vines. This article is based on the writer's experience and observations on bench grafting in Australia and New Zealand and is designed to focus greater attention on this useful but rather neglected method of vine propagation.

For speed and efficiency bench grafting is superior to other grafting methods and has special application for planting sizable areas of vineyard. Bench grafting on a well-organised system can achieve a daily output of about 1000 grafts per operator, a performance which could not be remotely approached by other grafting techniques. The final percentage of successful grafts attainable is usually much higher than with other methods, being in the vicinity of 95 per cent.

The high production rate and efficient results obtained with bench grafting are made possible by the simplicity of the technique and the maintenance of controlled conditions of heat and humidity during callus formation.

Every grape grower, irrespective of the size of his vineyard, will find pleasure and profit in knowing how to make bench grafts. With other methods of grafting conducted in the field or nursery the grafting operation is less convenient and results depend largely on favourable weather. Dry weather retarding the flow of sap or cold, wet weather is inimical to callus formation and causes most failures with field grafting.

PROCEDURE FOR BENCH GRAFTING OF VINES

Box of grafts from callusing room. Some moss has been unpacked to show the grafts. A nurseryman points to strongly callused graft unions.

Suitable Stocks

All systems of grafting, however, have special applications and limitations according to circumstances, and bench grafting is no exception. Bench grafting has the main limitation of being confined to comparatively few stocks for high performance, as many stocks are not well adapted to this way of grafting.

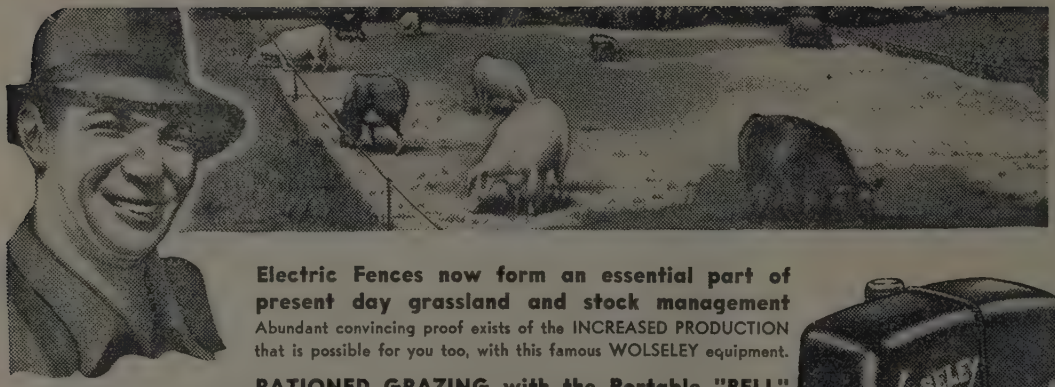
Generally only vigorous stocks which strike root easily are well suited to bench grafting. Best results have been achieved in New Zealand with Mouvedre X Rupestris 1202 stock and good results have also been reported with Baco No. 1. Aramon X Rupestris Ganzin No. 1 (A.R.G. 1) has been favourably reported on in overseas literature for bench grafting, but this stock has not been tested in New Zealand. Cordifolia and Berlandieri stocks have proved definitely unsuitable and only comparatively poor results have been achieved with Riparia X Rupestris 3306, 3309, and 101-14.

Stock Cuttings

The stock cuttings should be taken from the vines about mid-July, cut into lengths of about 15in., and tied in bundles of 50 for convenient handling. Of the various methods tried for storing the stock cuttings until required for grafting, the following has proved most satisfactory.

A well-drained soil in a sunny position is selected. The bundles of cuttings are then half buried in an upright position by puddling them into holes which have been soaked with water. Puddling the soil and moving the bundles up and down when burying them permit the soil to penetrate between the cuttings, thereby excluding air and preventing deterioration from mould development. It has been found advantageous to leave the scion wood on the mother vines until late August where practicable. The scion cuttings are pruned to lengths of about 2ft., tied into bundles, labelled, and stored in a cool, shaded position on the south side of a building or hedge and covered with sand.

The labels used for identification of the scion wood should be made of copper, plastic, or other durable material, as cardboard labels tend to disintegrate in a sand bed. Careful attention to the storing of stock and scion wood is essential, as wood which



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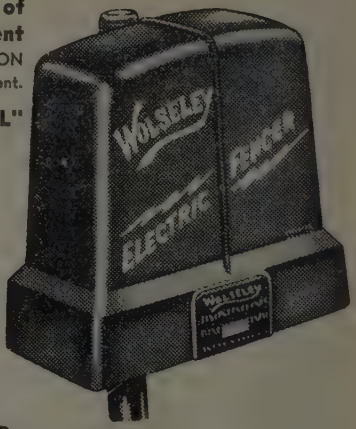

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has dried out to any extent preparatory to grafting will give poor results. If the scion wood has dried somewhat and there appears insufficient sap when the wood is dissected, it is advisable to cut it into pieces of one bud and soak it in water overnight before grafting.

Grafting

The grafting operation is best conducted not earlier than the second to third week in September to obviate the retarding effect of a cold nursery soil when the grafts are planted. When the stock wood, stored according to the above recommendations, is lifted for grafting some of the buds have usually begun to grow, but this is in no way detrimental to results.

Bench grafting may be conducted indoors if the weather is unpleasant or outdoors if conditions are suitable. The work is greatly simplified if stock and scion wood is previously sorted into corresponding sizes and placed in bins in a handy position to the grafting operator, who works seated behind a bench or table.

Stock and scion are joined by making the well-known tongue or whip graft. Provided the wood is reasonably well matched for size and the graft fits securely, minor imperfections are of little account. It is, however, preferable to have a slight overlap at the side points than an exposed area, which may occur if the cut surfaces are of unequal angles or the incision to form the tongue is insufficiently deep. A and B in the illustration at right show the jointing of stock and scion by the tongue graft. A well-made tongue graft holds the graft firmly enough without its being tied. Tying is actually detrimental as it interferes with callus formation.

Preparing Boxes of Grafts

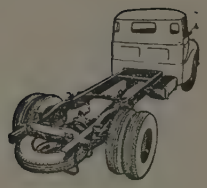
As the grafts are done they are collected and carefully packed into boxes lined with 2in. to 3in. of green sphagnum moss and transferred to the callusing house. A suitable type of box is shown in the illustration on page 23. This box has just been taken from the callusing house and some of the moss has been removed to show the grafts. The nurseryman is pointing to the heavily callused graft unions.

The sides of the box are slatted to permit ventilation and one of them is hinged with strips of leather. With

Sections of a typical bench grafted vine, showing the profuse callus formation and strong roots and shoot development after 3 weeks in callusing room.

BENCH GRAFTING OF VINES

Bench grafting sequence. A—Prepared stock and scion wood. B—Stock and scion jointed by whip or tongue graft. C—Untrimmed graft after callusing. D—Trimmed graft ready for planting.



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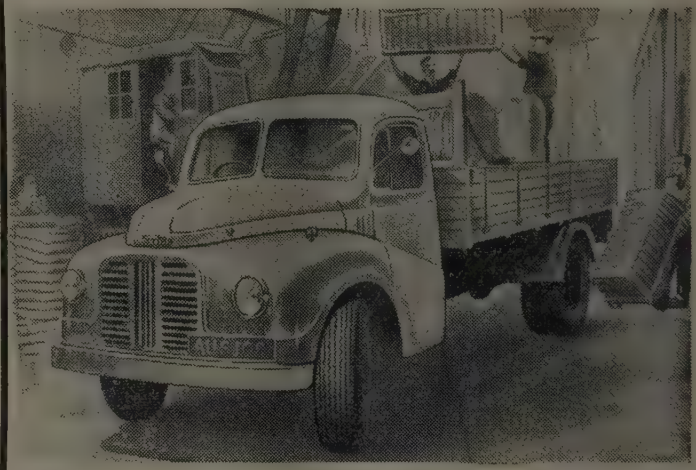

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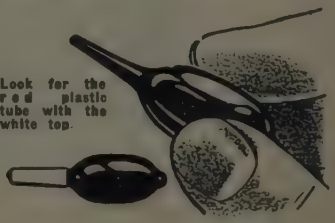

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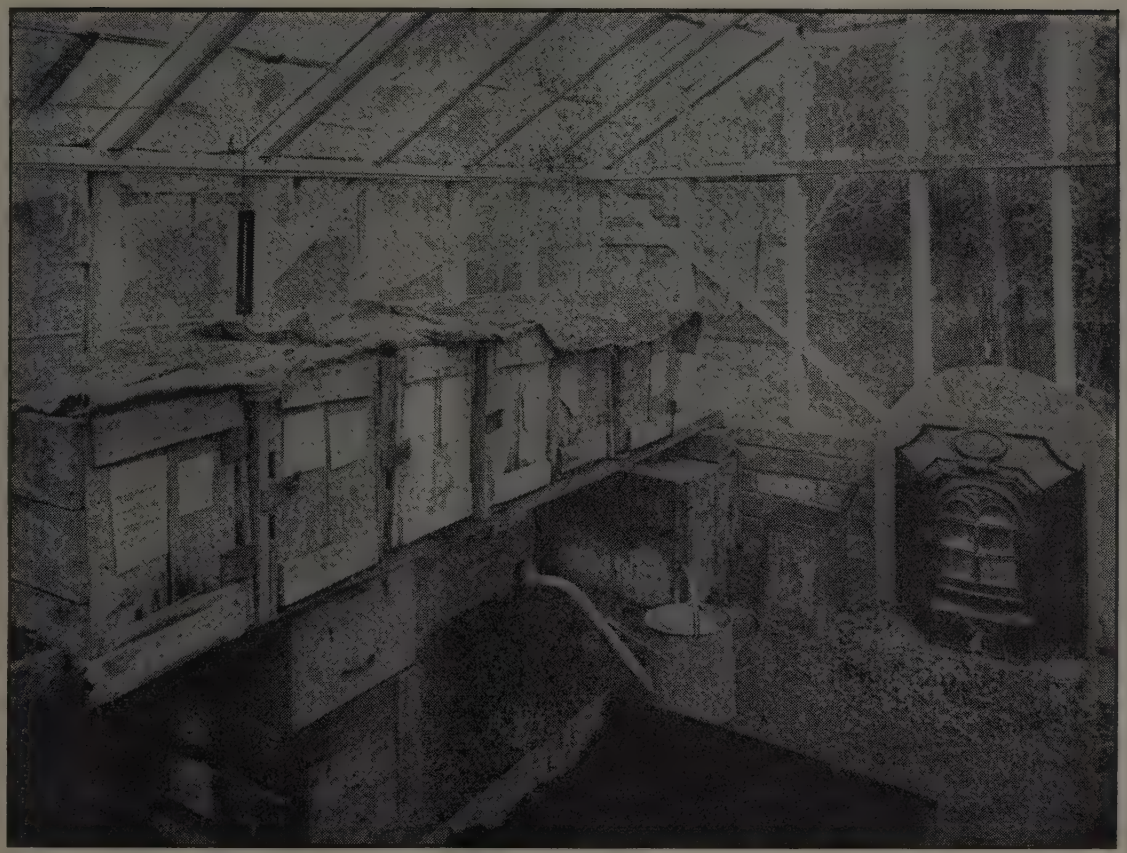

Glasshouse adapted for callusing bench grafts, showing heating arrangement, boxes of grafts, and water tank in which boxes are immersed (foreground).

the side open the three interior walls of the box are lined with moss and the grafts stacked in as shown. When the box has been packed almost to capacity the open side is also provided with a layer of moss, the movable side is closed, and the tops of the grafts are covered with a light sprinkling of moss.

It is most important that all the tops of the grafts be at the same level, as otherwise the buds on the lower ones tend to rot. It has also been found an improvement to insert small slats of wood between some of the layers of grafts to improve ventilation. Good ventilation improves callus formation and reduces deterioration by rot organisms, which can become troublesome under the high temperature and humidity in the callusing house if ventilation is inadequate.

Callusing Grafts

A small glasshouse which has been adapted for callusing bench grafts is shown in the illustration above. In the foreground is a shallow tank in which the boxes of prepared grafts are immersed before being placed in position on the bench at left. Sacking has been laid on top of the boxes to help maintain humidity and for easy observation of the contents. Humidity in the boxes has to be maintained almost at saturation point.

A watering-can with a fine rose or hose is used to sprinkle the boxes with water at regular intervals. Frequency of damping down the house and boxes of grafts is usually a matter of judgment, but generally this attention must be given once daily. The condition of the moss on top of the grafts is a useful guide to moisture requirements; it should be neither wet nor dry but just damp. It is advisable to dip the boxes of grafts in water once a week, immersing them only about half way to avoid wetting the graft unions.

Temperature and Humidity

A hygrometer or wet and dry bulb thermometer is useful for indicating the humidity and watering requirements. and a thermometer is essential. In the background of the illustration of the small glasshouse is a small domestic type of coke or coal heater. By regulating firing and adjustment of the damper it is possible to maintain the heat in the house conveniently within the required temperature limits for callusing of 80 to 90 degrees F. The provision of a thermostatically controlled electric heating unit instead of a fuel heater simplifies temperature control.

Possibly the optimum temperature is about 85 degrees F., but maintenance of an exact temperature is not critical and good results are assured if the grafts are held between 80 and 90 degrees. Higher temperatures are undesirable because they increase the activity of spoilage organisms; lower temperatures retard the development of the grafts.

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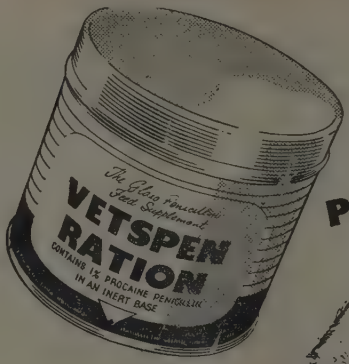

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Left—Planting out bench grafted vines in a nursery. Right—Final covering of the grafts in a nursery is done by hand to avoid injury to delicate shoots.

Some authorities consider that high callusing temperatures have an ultimate weakening effect on the grafted vine.

Glass construction is not essential for the callusing house and many are built of various other materials incorporating an insulating lining to reduce heat loss. A glasshouse has good lighting, takes advantage of solar heat, and can be put to other uses when not wanted for callusing vine grafts. In hot weather the natural temperature in a glasshouse can be excessive unless the ventilators are used, and much of the time artificial heat is required only at night.

The period required for callusing the grafts varies from 18 to 21 days. The grafts are then transferred to a nursery and planted out in the vineyard in the following season.

The remarkable callus formation, profuse stock roots, and vigorous scion shoot which have developed from a typical bench graft when taken out of the callusing house after 3 weeks are shown in the illustration at left on page 25. The method of storing the stock described earlier seems to account for this exceptional root development.

Treatment after Callusing

From the callusing room the boxes of grafts are taken directly out to the nursery. Any shoots on the stock are rubbed off by hand and the shoot on the scion is pinched back to one leaf before planting. Only the roots at the base node are left on the stock. C and D in the illustration at right on page 25 show the appearance of untrimmed and trimmed grafts respectively.

The fertility and condition of the nursery soil are most important. A fertile, friable, and well-drained soil is essential for a vine nursery, particularly for bench grafts which have started to grow and require good conditions to avert any setback. Before planting, the soil should contain adequate moisture and watering by sprinkler should be carried out if necessary.

Planting out of bench grafted vines is shown in the illustrations above. The vines are spaced about 6in. apart in trenched rows. When the trenches are partly filled the soil is pressed gently but firmly around the bases of the grafts, from which the roots emanate. Consolidation of the moist soil around the base roots is important. The final mounding up must be done carefully to avoid injury to the delicate shoots and the last of the soil should be placed in position by hand. In addition to weeding and spraying the nursery vines it is important to trim off any scion roots which may form. This is usually done in December.

To obtain stronger and even more precocious vines by bench grafting, 1-year-old rooted stock may be used instead of cuttings. With rooted stock it is necessary to prune the roots severely before grafting.

Another interesting feature of bench grafting which it is useful to know if there is a scarcity of scion wood, is that successful grafts can be made even with very thin, spindly wood useless for other grafting methods. With such wood a cleft graft is used, the bark or cambium layers of stock and scion on one side being matched.

All photographs by Sparrow.

ZK-B
DH

Delivering Fencing Material by Air

By G. J. NEALE

AFTER the initial and subsequently rapid and spectacular success of aerial topdressing, the possibility of delivering fencing material by air has been explored. For some time an inter-departmental committee carried out trials culminating in a public demonstration on hill country at Porirua, north-west of Wellington, on 21 April.

THE successful demonstration of dropping fencing material from an aircraft completed a project which began in March 1954, when Mr. E. A. Gibson, Director of Civil Aviation, set up a small committee to organise some preliminary experiments.

The rapid increase in aerial topdressing had accentuated the need for more fencing on hill country. The difficulty of carrying heavy fencing material to rugged hill country had opened up the question of aerial delivery and it was essential that this should be done safely and as efficiently as possible.

The committee, comprising representatives from Civil Aviation Branch (Air Department), Soil Conservation and Rivers Control Council, the Department of Agriculture, and the de Havilland Aircraft Co. of New Zealand Ltd., was set up to devise methods of overcoming some of the problems and to co-operate with the de Havilland Company, which was willing to make a suitable Beaver aircraft available for trials. It was largely due to the skill of the company's chief pilot, Mr. R. N. Jamieson, that the series of experiments, involving 22 flights, was accomplished safely and with increasing proficiency, until at last successful methods of bundling, loading, and dropping could be demonstrated.

Early Problems

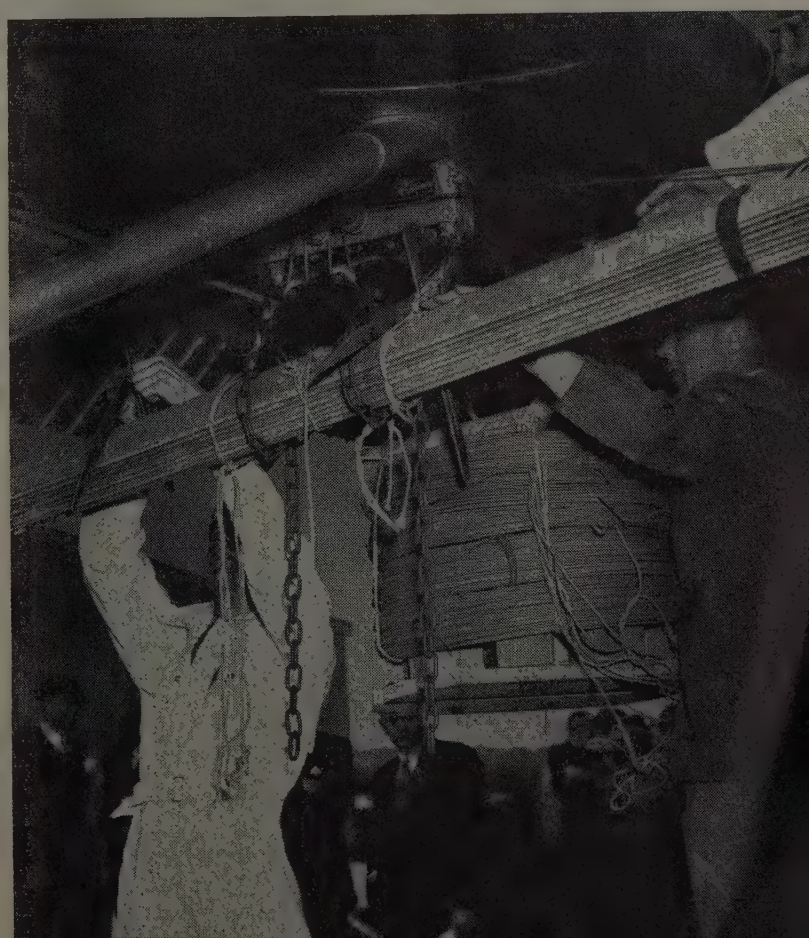
Previously a few spasmodic efforts to drop fencing material from aircraft with varying degrees of success and some resulting in failure on account of breakages had been reported from various districts. Wooden posts, in particular, either broke on impact or were embedded in the ground when dropped singly, and wire appeared to suffer damage, so that early reports did not appear favourable to aerial dropping of fencing material.

But when it was considered that the millions of acres of hill country now being topdressed by aircraft will eventually necessitate thousands of miles of new fencing for the closer subdivision and better pasture management required if the full measure of increased production is to be obtained, it was felt worth while to make special efforts to overcome all these problems.

The use of parachutes, because of the success in delivering many kinds of material for deer shooting parties in back country by this means, appeared at first to be the only alternative to excessive damage. But parachutes, even those made from hessian or similar cheap material, would have meant increased expense and as full control from aircraft to ground is not possible when parachutes are used, recovery of the loads would present difficulties.

The Director of Civil Aviation in searching for an answer to these problems considered that if safe flying and accurate delivery were to be ensured, fencing material should be transported on planes fitted with bomb racks so that it could be released either mechanically or electrically by the pilot without interfering with his flying operations. Trials of this principle required a special aircraft and as soon as one was available experiments began. The first tests were designed to investigate the types of material which could be bundled and tied on to each bomb rack, of which there are five on the Beaver, two under each wing, each capable of carrying 250lb., and one under the fuselage carrying 850lb.

The first drops began on 20 September 1954, when several bundles of fence posts and battens threaded through the coils of wire were released from the aircraft. Both posts and wire were damaged, and it was decided to separate the wire and the posts. Sub-



Illustrations—On opposite page, at top, dropping on the target the load of 4 coils of wire on a drum and steel posts, shown being attached to the bomb racks at bottom right of this page. On opposite page, at bottom, 4 larch strainer posts are slung under each wing of the aircraft. A block and tackle system with chains lifted the loads and "cradles" prevented their swaying during flight.

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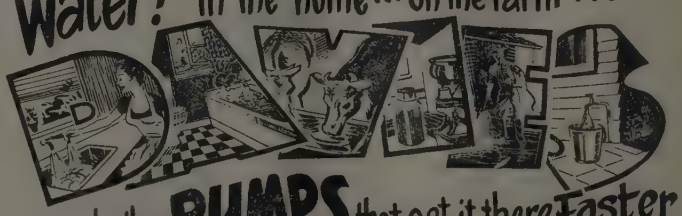

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sequent trials indicated that posts bundled together with wire sometimes suffered damage, but damage was almost eliminated by bundling with rubber bands and light rope so that the bundles burst on impact with the ground. The rubber bands appeared to absorb a great amount of energy before breaking so that the posts and battens came to rest without damage.

Similarly with wire, it was found that damage could be avoided by winding the wire on special wooden spools 10in. in diameter or packing several coils of wire round an empty paint drum and wedging it with timber. The same effect of the bursting bundle was obtained by the latter method; the first method had the initial disadvantage in that wire for aerial dropping would presumably have to be specially wound by the manufacturers, perhaps at a slightly greater cost than usual. No progress could be made in the problem of dropping concrete materials. Pre-stressed posts dropped singly without damage, but were damaged when dropped in a bundle. Ordinary concrete posts and special light-weight pumice posts were damaged even when dropped singly or in bundles. Split wooden posts when bundled with light rope and secured at the two ends by rubber bands (cut from old motor tyres) dropped satisfactorily.

Having established suitable bundling techniques, the investigating committee turned its attention to a suitable loading device. Fortunately a block and tackle system had been designed for use with the Beaver aircraft and this proved very suitable for loading the wings. The load could be hoisted on to the wings by one man and pushed into position by another assistant. Unfortunately it was not suitable for loading the bundle of 850lb. on to the fuselage, and it appears that an alternative method will have to be evolved for this; either the use of a jacking device or the provision of three separate racks under the fuselage. The de Havilland Company in Canada is studying a possible modification specially for loading the fuselage by three separate racks.

A device for minimising sway when a bulky load was being carried was evolved by providing two steel cradles to each rack. When the aircraft was in flight the two arms of this device gave stability even to larch strainer posts 11ft. long.

The Demonstration

After being postponed from 20 April because of unsuitable weather, a public demonstration of the technique evolved by the committee was held on an airstrip on the property of Thos. Maher Estate, Porirua, on 21 April. The loads dropped represented almost a complete range of items of fencing material except the concrete posts previously mentioned. Near the air-

Top—Loading wooden posts and strainer for the fourth flight. Middle—Material assembled on the airstrip for loading. The fenceline (see dotted line) was up the slope in the right background. Bottom—The fenceline along the ridge, showing the distribution of fencing materials after the second and third flights.

Part of the steel fence built on the demonstration site from materials dropped from the air.

strip was a steep hill on which a steel fence was being built and two loads carried by the aircraft included material for the remaining 10 chains of the fence. Some miscellaneous fencing material was dropped on a small area of flat ground at the base of the hill. Visitors to the demonstration were therefore able to see from a central point all the operations involved, from the loading to the take-off, and after each "drop" they could inspect the material for any signs of breakages or damage. Much of the material dropped showed the results of manufacturers' efforts to adapt standard material and to find new mouldings and materials for aerial dropping.

The **first flight** consisted of
Four ½cwt. coils of No. 8 wire,
19 steel posts,
250 steel battens, and
Four ½cwt. coils of barbed wire.

These were dropped on the flat and it was obvious that the method of bundling the posts and battens and packing the wire on an empty paint drum with timber wedges obviated any damage to the material.

The **second** and **third flights** consisted of
61 steel posts,
250 battens,
4cwt. of No. 8 wire, and
½cwt. of barbed wire.

To drop these materials the aircraft flew across the ridge and the loads were released to fall as near as possible on the fenceline. This was a crucial test of the pilot's accuracy, and the manner in which it was accomplished was impressive. The bursting of the bundles when they struck the crest of the ridge naturally resulted in some of the material being scattered a few yards on either side, but with the exception of a coil of wire which rolled down one side of the ridge, all was handy to the fenceline. One of the posts and several of the battens were slightly bent, but they could be used after straightening. The rolling of individual coils of wire could be prevented by tying the coils together but leaving a fair length of cord or rope between each so that one coil anchors the other.

The **fourth flight** comprised
36 sawn battens,
10 silver pine posts,
One sawn red beech strainer, and
Four hardwood posts.

These were dropped on the flat without damage.

On the **fifth flight** each of the 4 racks carried
Two larch strainer posts (8in. diameter and 11ft. long) for possible use in building stockyards.

These landed safely on the flat.

The **sixth flight** included
Two ½cwt. coils of wire specially rewound on 10in. diameter wooden spools,
Four ½cwt. coils of wire packed on a paint drum spool,
10 steel posts,
20 waratah battens, and 100 steel battens.

These were dropped on the flat without damage.

It was obvious that with the correct bundling technique for the posts and battens and the use of spools for the wire, either specially made from wood or wedged on to a paint drum, damage is reduced to a minimum. The provision of bomb releases on the aircraft enables the loads to be dropped safely and with a great degree of precision.

Ground to Air Communication

Also demonstrated was the use of radio-telephonic equipment providing communication between pilots and ground staff. The small two-way radio receiver, which can be readily fitted to topdressing planes, has an effective range of 30 miles. It operates with the aid of a loudspeaker in the cockpit and the pilot speaks through a small hand microphone. Contact with the ground is maintained with a mobile base station carried in a car, and air-to-air communication is also possible.

A glimpse into the future was provided by the broadcasting of a recorded presentation by the Civil Aviation Branch of the degree to which radio-telephonic communication could enter into a highly developed system of aerial farming. The air appeared to be full of directions regarding the organisation and delivery at stated points and specified times of equipment and supplies, flight directions and weather information for pilots, and advice to other commercial flights in the area. Wellsian though its conception may have appeared to the layman, it indicated the ramifications of the application of the aeroplane to the farming industry.

The days when a farmer jogged along to the railway siding in his spring dray to unload a truck of fertiliser already seem a long time ago. Whether or not the dray and the drill join the farm horse as museum pieces, it is certain that if aviation continues to enter into farming as rapidly as it has done in the past few years, there will be no lack of fertile ideas to speed its development and to effect whatever adaptation is required.

Good Management is the Foundation of Profits in Pig Production

WHEN pigs have been weaned it is necessary for management to be thorough from that point onward or the net return on the pigs will be considerably reduced and good work put into litter production will be wasted. In last month's "Journal" I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, dealt with management of sows and litters during winter and early spring and emphasised the importance in securing maximum profit of producing large litters of strong, healthy pigs and weaning them at a heavy weight. In this month's article the same author continues his discussion of good management, dealing with litters from weaning until they reach slaughter weight.

LITTERS of pigs farrowed in winter and early spring have a great advantage over summer and autumn litters in that the supply of skimmed milk or whey grows with the pigs as the dairy herd's output rises to the peak of production in November and December. With this steadily increasing supply of skimmed milk or whey litters can be taken most economically up to baconer weights, and with the present state of the market this will be the most profitable course.

The most important point to remember about taking pigs to baconer weights is that pigs make the greatest development of lean meat or muscle during the first 4 months of their lives. From this point onward it is very difficult to increase the proportion of lean to fat in the animal, but all too easy to increase the proportion of fat to lean. The result can be an overfat carcass that nobody wants.

Carcasses of pigs that have received a severe check after weaning or that have suffered a long store period, during which they have stood still instead of growing, generally show wasting of the muscles or lean meat. This is particularly noticeable in the loin rashers, in which the wasting of the eye of meat can be clearly seen, as also can the fact that when the pig began growing again the lean meat did not build up, but the fat above it did. Thus the two most important factors in management from weaning to slaughter are that the pigs should suffer no check from weaning to 4 months old and that they should be fed in such a way during the last 6 weeks or so before slaughter that they do not become overfat.

Feeding after Weaning

When weaned, pigs are still comparatively small and cannot deal efficiently with large quantities of liquid food such as skimmed milk or whey. The results of feeding nothing but liquid dairy by-products to weaners and small pigs can be seen in those unfortunate animals that look like animated balloons. They have been trying hard to consume sufficient food to obtain the nourishment that they require, but have not been successful, because they have not the capacity to take enough.

After weaning pigs should be fed the same meal mixture that they were getting in the creep at 1lb. per day at least to each pig until they are 4 months old. A mixture of one-third meat meal and two-thirds barley meal can be used, but dried buttermilk powder, which is now available for stock feeding in many parts of the country, can be used instead of meat meal and can also be mixed with meat meal in the proportions of 4 parts of buttermilk powder to 1 part of meat meal. The mixture can be used in place of meat meal and in the same way: 1 part of the mixture to 2 parts of barley meal.

In addition to meal the use of a little tallow or fish oil for 4 to 6 weeks after weaning prevents pigs losing the bloom that good weaners have. Not more than 4oz. of tallow or 1oz. of fish oil a day for each pig should be used and a little should be given in the creep for a few days before weaning to get the pigs used to it.

Use of Meals

As pigs should be left in their farrowing quarters for at least 10 days after the sow has been removed at weaning, the meal mixture can still be fed by a self-feeder if one was used in the creep. Otherwise the meal should be fed dry in a trough. Skimmed milk should be fed at 1½ gallons to each pig a day at weaning and this quantity should be steadily increased to 2½ gallons a day by the time pigs are 4 months old. When whey is used the quantity should be ½ gallon more per day than that for skimmed milk.

For successful feeding from weaning to 4 months old at least 1 food unit of the pig's daily rations should be concentrate (a good meal mixture) and the balance skimmed milk or whey.

HEADING PHOTOGRAPH: Good weaners deserve good management. National Publicity photo.

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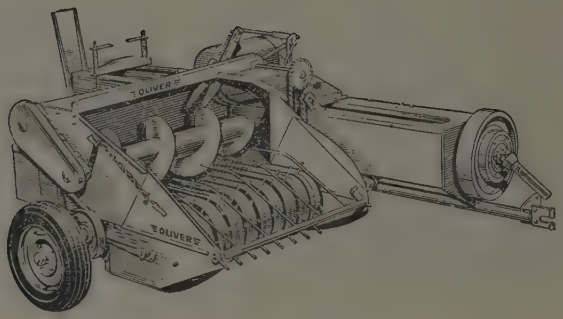

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A fattening house that is well insulated, a particularly good feature being the ceiling construction.

Young pigs cannot be expected to do well on liquid dairy by-products only.

Value of Good Housing

Good feeding is essential to success, but good housing can make good feeding still more effective. Pigs should remain in their farrowing quarters for 10 days after weaning and if the round farrowing houses mentioned in last month's article are used, the pigs will be warm and comfortable even though the sow is no longer with them. However, the pigs cannot be kept in their farrowing quarters all the time, as apart from the fact that these are probably required for another sow, there is not sufficient room. The litter should be kept together as a group, as they will do better than if they are separated and mixed with other pigs and put into what for want of a better term may be called fattening quarters.

The designs of fattening quarters are many and varied, as also is their efficiency in providing the pigs with what they need to satisfy their requirements. The basic needs of pigs in housing are: A warm, dry place in which to sleep; a place to feed in; and a place to dung in apart from that in which to sleep and feed. Research has shown that fattening pigs do best when the temperature is about 65 degrees F. and the fattening house should be designed to maintain as even a temperature as possible at about this level—at least in the sleeping quarters and preferably in the feeding and dunging area also. In New Zealand the problem resolves itself for by far the greater period of the year into keeping the pigs warm, particularly in spring which is the time of year covered in this article.

Insulation of Fattening Quarters

Artificial heating of fattening quarters is far too costly to be considered and so the heat given off by the pigs themselves must be used to keep the house warm. This clearly shows that the answer to the problem is to insulate the house against heat losses. Insulation works two ways, as a well-insulated house not only prevents loss of heat from the inside but tends to keep the inside temperature down when the outside temperature becomes excessive.

The place that requires most attention is the roof, where by far the greater portion of heat losses occur if it is not properly insulated. Ventilation should be by controlled openings well above the pigs to avoid all draughts; these openings need not be large, as pigs do not require vast quantities of fresh, cold air and only 6 sq. in. of ventilation area to each pig is necessary. Fattening houses should be built in units to hold 10 to 12 pigs each and should be kept as dry as possible while pigs are in them. Pigs that are warm and comfortable do not soil their sleeping and feeding area and it should rarely be necessary to wash down daily more than a small portion of the dunging area.

Fattening house design has been adequately covered in previous articles in the "Journal", but a cardinal principle is that fattening houses should be constructed so that an even temperature of about 65 degrees F. can be maintained in them. Good feeding and good housing will prevent the pigs from experiencing any check between weaning and 4 months of age.

Final Stage of Feeding

Finally there is the most important point of the feeding of the pigs during the last 6 to 8 weeks before they reach finished baconer weight, which for winter and spring litters when plenty of milk and whey are available should be from 150lb. to 160lb. carcass weight.

When the pigs are 4 months old any animals that are short and show signs of early maturity should be separated from the others and disposed of as porkers as soon as they have reached the required weight. Pigs of this type will not produce satisfactory baconer carcasses, and there is always the possibility that there will be one animal or more of this sort in a litter.

A pen of good baconer pigs. The ration to baconers should be restricted to avoid overfattening.

For the last 6 to 8 weeks pigs can be taken on to baconer weight on a diet of skimmed milk alone. However, they should be allowed to run out on good pasture several times a week during the day when the weather is suitable. This applies to pigs during the whole period from weaning to slaughter; in fact the younger they are the more frequent should be their opportunities for a run out.

Pigs being finished on skimmed milk alone will, if they are allowed to, consume very large quantities, and if they do, overfat carcasses result.

To produce a really good carcass it is necessary to restrict the skimmed milk fed from the time a liveweight of 120lb. is reached. Not more than 6 gallons of milk should be fed to each pig per day at any time.

If the farrowing dates of sows have been properly planned, so that there are sufficient pigs at the peak of production of the dairy season to use economically the feed available, there will be no surplus of skimmed milk. If there is, it is far more economical to preserve this as curd for future use than to waste it by producing overfat baconers, for which a lower price may have to be accepted.

When whey is used the quantity fed should be not more than 8 to 10 gallons to each pig per day and ½lb. of meat meal or 1lb. of mixed meal should be fed with it. Baconers cannot be finished as satisfactorily on whey alone as they can be on skimmed milk.

Achieving Best Results

The object of keeping pigs on a dairy farm is to obtain the highest possible net return for skimmed milk or whey which cannot be used in any other way. To do this management of pigs must be of a high standard throughout their development.

Breeding sows must be carefully looked after so that they are in a condition to farrow large, strong litters of pigs that can be weaned at heavy weights. Litters of pigs must be well fed in the creep and adequately housed so that they can make the maximum amount of growth while they are still suckling the sow. They must not be allowed to experience any check after weaning and up to 4 months old must be well fed on rations containing at least 1 food unit of meal concentrates.

The houses in which pigs are fattened should be constructed so that an even temperature can be maintained in them. During the last 6 to 8 weeks of the fattening period food must be restricted to produce first-class carcasses.

If attention is given to all the points already referred to, winter and early spring litters will grow into really good baconers and the farmer will get a good net return for his skimmed milk or whey.

EDITOR —— P. MACKINTOSH

THE JOURNAL OF THE BRITISH GRASSLAND SOCIETY

This Journal is a medium for the publication of the results of research and practical experience in the realm of Grassland Husbandry.

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Effects of Excessive Humidity on Beekeeping

HUMIDITY is an important factor in honey production and its effects and influence are felt in many aspects of beekeeping, including plant life, nectar secretion, honey grade and keeping quality, activities of bees, disease, and deterioration of equipment. R. S. Walsh, Honey Grader, Department of Agriculture, Auckland, in this article draws attention to this subject which has an important bearing on the welfare of the honey industry.

TEMPERATURE and moisture are important factors in plant growth and in nectar secretion. Plants can endure a wide range of temperature, but can secrete nectar only within certain limits. Large quantities of water are used when plants are most active in absorbing plant nutrients and in transpiration, but not a great amount is required for secreting nectar.

Beekeepers are frequently at a loss to explain why nectar is plentiful in some localities and poor in others that appear to be similar in all respects. This could be accounted for by one locality being favoured by a correct balance of temperature and humidity.

It has long been considered that cool nights followed by hot days were the ideal conditions for a good honey flow. These conditions are not in themselves the reason, but good days are necessary if nectar secretion is to be expected, and in summer fine days usually follow cool nights. The greater the variation in temperature between day and night is the lower the percentage of relative humidity is likely to be and the more certain it is that the correct temperatures for nectar secretion will occur.

Inland districts usually experience lower humidity than those near the sea. Not infrequently bees gather no nectar from the coastal pohutukawas until 4 p.m., when there is usually a decrease in humidity and a rise in sugar concentration.

Sometimes districts that have consistently given good crops of honey, for some seasons produce poor crops of lower quality, and poor-producing areas improve considerably. This is often the result of climate changes. There may be a series of wet or dry seasons accompanied by a change in the relative humidity experienced in previous years.

Activity of Bees

High humidity and low temperatures in the Auckland district in the early part of the season have often resulted in heavy losses from spring dwindling. Conditions such as these affect the flight of bees, as moist air is a better conductor and reduces the heat of their bodies much sooner.

During summer when humidity is high bees will cluster in and round the hives. This is no doubt due in part to humidity having cut off the secretion of nectar. Warm, humid weather encourages swarming, and any change to hot, dry weather will change the mood of the bees. Usually any queen cells started during humid weather will be torn down when the weather changes suddenly to heat with very low humidity.

During periods of very humid weather bees are cross and difficult to handle and are prone to robbing. No doubt the humidity which has cut off the nectar supply is again mainly responsible.

Detrimental to Honey

A heavy honey flow is responsible for a more uniform and better-quality honey than that produced when the flow is light and spasmodic. Bees work fewer sources and the honey is usually lighter in colour and of better flavour and density. Good flows occur when humidity is low, and the dry atmosphere ensures less moisture in the nectar and enables the bees to ripen the honey more easily. Under these conditions the honey takes up little atmospheric moisture during extraction by the beekeeper and a honey of high specific gravity reaches the market. Unfortunately the whole of New Zealand does not experience such favourable conditions every season, some districts each year suffering from excess humidity.

High rainfall does not affect the quality of the honey crop adversely unless it is accompanied by excessive humidity. The average rainfall of the west coast of the South Island is one of the highest in the Dominion, but the specific gravity of the honey produced there is much higher than that from many other districts. The sources from which the honey from the west coast of the South Island is obtained, native trees and bush, are partly

HEADING PHOTOGRAPH: Apiary situated in sheltered, sunny position, showing most of the hives with gable lids. These are used as an aid to the escape of moisture from the hives.

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responsible for its density. However, honey should not be extracted during wet weather.

Any lines of honey of low specific gravity from South Island west coast districts usually contain some pasture honey. The influence of humidity on quality and appearance of honey is felt even after it has been packed. Honey keeps best when stored at 45 degrees F. and a humidity of under 60 per cent.

Moisture can permeate honey cartons, and lids do not exclude it indefinitely. Thus high humidity can cause surface moisture in the containers.

Toll of Bees and Equipment

Low winter temperatures with high humidity are particularly severe on wintering bees, as atmospheric moisture and exhalations by the bees condense in the hive, and lids, supers, and combs become saturated with water. Mouldy combs and damp conditions take heavy toll of bees and in some winters in the Auckland district many hives die out. Though colonies may not suffer so severely elsewhere, they will, if subjected to these conditions, be less valuable honey-gathering units the following season.

Dry air is a poor conductor of heat; moist air is a much better conductor, and in a damp hive during a cold spell the loss of heat from the colony through conduction is at times very great.

High winter temperatures with high humidity are also detrimental to wintering bees. Under these conditions the bees become active, consume stores, and wear themselves out when they should be resting in semi-hibernation.

[*Rendell's*

During summer when humidity is high bees will cluster in and round the hives.

Hive moisture resulting from low temperatures with high humidity causes considerable expense in replacement of supers and hive parts.

It is not unusual in the Auckland district to obtain not more than a year's service from some hive equipment. Lids and supers are saturated for months and moisture lies on top bars and fills the rabbets of supers. The position is aggravated by the early spring honey flows that occur in the north. Attempts by the bees, often too weak for the job, to ripen large quantities of honey increase the moisture within the hive. Under such conditions the extraction of low-gravity honey is inevitable.

Bee Diseases

Though there does not appear to be any conclusive evidence that a warm, humid climate is not conducive to the spread of foul-brood, experience shows that these conditions are not favourable for the rapid spread of this disease that occurs in colder climates. This experience appears to justify crediting humidity with benefiting beekeeping in at least one respect.

A contributory cause of the dysentery that afflicts bees is an excess of moisture. Hives with contracted entrances and no special provision for ventilation become damp and moisture falls on the honey stores and increases the water content of the bees' food. An excess of moisture in their diet is said to cause dysentery in bees. High humidity is responsible in a number of districts for preventing the bees from keeping the hives dry and outbreaks of dysentery are a frequent occurrence.

As a safeguard against nosema disease beekeepers are advised to take every precaution against dampness by adjusting winter entrances to allow ample ventilation and to permit moisture to escape. They should also be certain that bees receive the maximum of sunlight and are not placed under trees or in other shady places. Precautions taken to guard against nosema also protect bees from dysentery and should an outbreak of nosema occur, hives free from dysentery will be much less likely to spread nosema to healthy bees and to other colonies. In districts where humidity is frequently excessive these precautions are exceedingly important.

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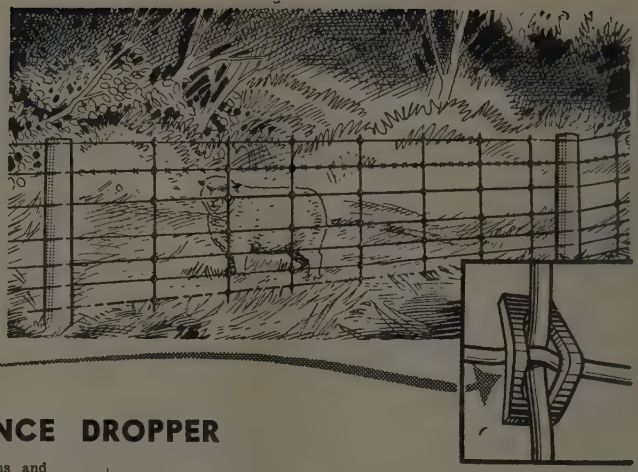

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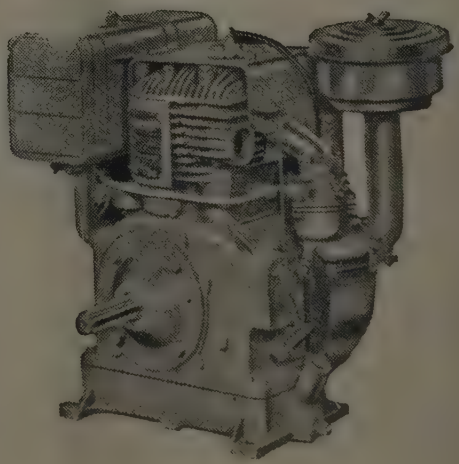

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Brooding and Rearing Chicks for Household Flocks

THOUGH backyard poultry keepers are generally better advised to buy stock at the perching pullet stage, some have suitable facilities and the inclination for rearing day-old chickens, and useful experience and even pleasure in successful achievement can be obtained by rearing the replacement stock. Provided no undue setback occurs in the rearing, the cost of the reared pullets will be less than that of buying perching pullets. Sideline poultry keepers, if they want to keep costs to a minimum and profits to a maximum, must rear their own stock. Advice on the subject is given in this month's article for the household poultry keeper by the Animal Industry Division, Department of Agriculture.

THE tendency in most businesses is now toward specialisation. Though any farmer must to some extent be a "Jack of all trades", the poultry farmer has to take many factors into account to attain efficiency in his business.

First, he must decide whether to make his main objective egg production or sales of stock—day-old chicks or perching pullets. Then he has to plan his layout to obtain the best results from the least labour and the smallest capital expenditure. Just as the commercial poultry farmer must operate at a profit, so the household poultry keeper should aim to do the same.

Too many backyarders say they keep a few hens merely to provide enough eggs for the family and admit they do not care what the eggs cost. Records should be kept of egg values and costs. If the value of the eggs, computed at retail prices, is not twice the feeding outlay, there is something wrong and whether the fault lies with the stock or management should be ascertained. Certainly the owner should be most considerate for the welfare of his hens, even to the extent of kindness, but culling out or killing ailing or poorly producing birds cannot be taken to indicate lack of kindness. Killing by dislocation of the neck is quick and painless; permitting a hen to die slowly of some painful complaint is cruel.

Hatching or Buying Chicks

As a commercial farm becomes larger it is found necessary to specialise in one branch or the other, so that economy in labour finally decrees that the hatchery side of the business should be separated from the egg production. The householder might argue that his case is different and that his poultry keeping is performed in spare time worth nothing, but that is only begging the issue that the working cost factor is essentially made up of feeding, housing, and replacement costs plus labour.

If it is proper that the commercial farmer should take all these factors into account, it is right that the householder should do the same. Consequently, even if a householder desires to rear the chickens from the day-old stage, probably he will find it better in the long run to buy the chicks rather than attend to his own hatching.

This should not be taken to mean that sideline poultry keepers are not recommended to run their own breeding pens and produce their own hatching eggs. There is a wide distinction between breeding and hatching, and whenever conveniently possible the sideliner should breed his own replacement stock.

One of the obvious disadvantages of buying chickens is the uncertainty of obtaining high-quality, well-bred, disease-free, strong, healthy stock. An owner who runs his own breeding pen knows his stock and has entire control over the selection of breeders. Any birds he does not like are culled out. In preference to attending to his own incubation, he should send the eggs out to be custom hatched by an experienced professional. No backyarders and few sideliners have flocks large enough to warrant running their own breeding programmes, but sideliners who have sufficiently large flocks should do so for the satisfaction of knowing the pedigree.

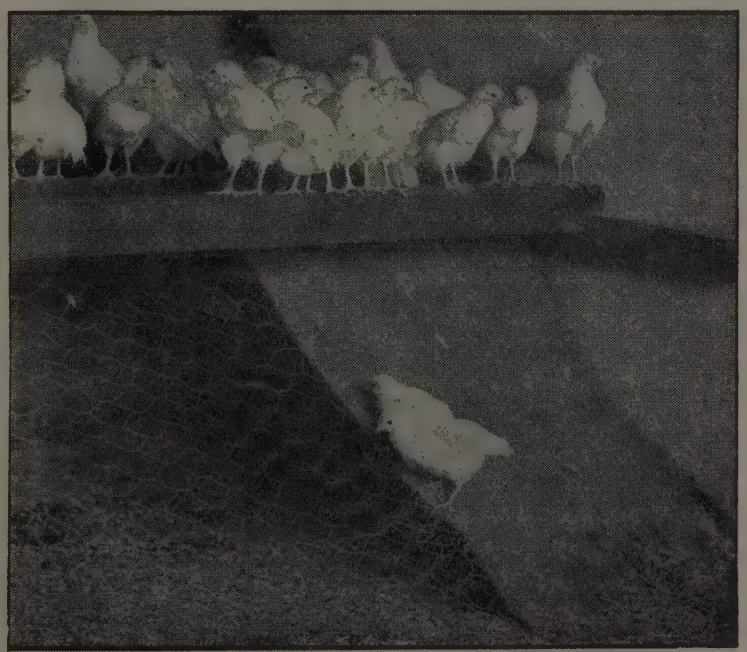
Some backyarders set a few of their own hens' eggs under a broody hen, but that has obvious disadvantages—first, the uneconomic cost of feeding the cockerel, and, second, the lack of separate pens, which entails mating up all the hens instead of only selected ones.

However, for an owner who has the time and inclination a great deal of interesting pleasure can be obtained from rearing chickens from the day-old stage. If this effort is ill fated, buying perching pullets late in the season to take the place of the pullets that died may be difficult, but with average mortality rates a man who is prepared to take the risk can cut down the cost of replacement stock.

Broody Hens

The household poultry keeper does not require details of electric, battery, and hot-water pipe brooders and of special battery cages and colony houses for rearing pullets once they are away from the heat.

The easiest way for the householder to rear chicks is to take advantage of the fact that the broody hen usually performs an efficient job of mothering. Though Nature has adapted the hen to



[Green and Hahn

A netting ramp from the floor to the front of the training perches enables pullets to be driven up to learn to roost.

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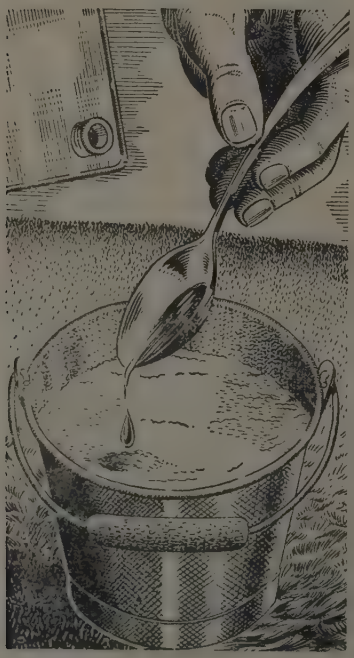

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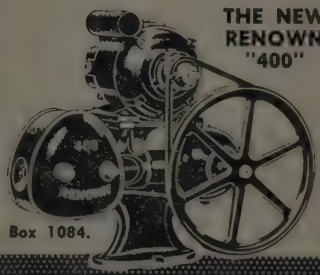

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RENOWN WATER SYSTEMS

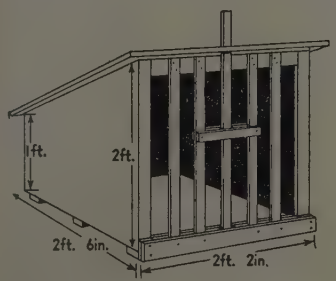
care for the chicks and the chickens to heed the broody hen, the process is not quite so simple that she does not need some assistance from man.

In view of the ever-present danger of contagious diseases and parasites being passed on from the mother hen to the chick, only hens considered to be healthy should be used for brooding. Before the chicks are given to her she should be dewormed and deloused. If she has scaly leg disease (caused by a mite), she should be treated for that trouble. The mother hen's internal and external parasites are certain to be passed on to the chicks, so prevention is the wise course.

The best way to deworm backyard hens is by carbon tetrachloride given in pill form. These can be obtained from a chemist. Lice can be controlled readily by applying a few drops of nicotine sulphate directly to the skin of the birds. Put 3 drops on the abdomen below the vent and 1 drop under each wing, on each side of the breast, and behind the head. This does not kill the lice eggs, so if such eggs are seen at the bases of the feathers on the abdomen, the treatment should be repeated 7 days later.

Scaly leg, if not too bad, can be cured by a few applications of crude oil, kerosene, or kerosene mixed with petroleum jelly smeared on the shanks. If kerosene is used, it must not be allowed to touch the skin, as it burns severely.

In New Zealand, where a high proportion of the hens are of the light-breed strains, obtaining a broody hen just when she is needed for brooding is often difficult, and even when one is available it has to be proved that she will obey the natural instincts. Some hens make poor mothers and will even kill the chicks they hatch or that are given to them. Some are highly nervous and others are clumsy. Though it is not necessary to use the same hen as hatched the chicks to brood them, it is advisable to test her with some eggs a few days before it is intended to introduce the chicks to her. If she sits tightly on the eggs, she will probably accept the chicks readily.



Brooding coop for hen and chicks. A wooden front with ventilation holes at the top can be placed in front at night to protect the hen and chicks from attacks by cats and vermin.

Chicks brooded with infra-red bright emitter lamps. A wooden surround limits the area available to the chicks, which are only a few days old. The surrounds are gradually opened up as the chicks grow and become accustomed to the source of warmth. One lamp only is needed for small numbers of chicks (25 day-olds).

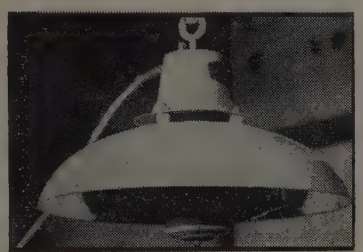
A hen can usually brood a larger number of chickens than the eggs on which she can sit, especially if the weather is suitable. A heavy-breed hen can easily sit on 15 eggs and under favourable conditions can brood 18 chicks or more. In cold weather she should not be given more than 15 chickens. The smaller the brood is the better she can care for them.

Shelter for Hen and Chicks

The hen and chicks must be given proper shelter. A simple, inexpensive type of coop is a box or barrel placed on its side with roofing material nailed over the top to keep out rain. Some sort of front is necessary to confine the hen, but the chicks should be able to get in or out at will. Storm water must be excluded from the coop, which must be high enough not to cramp the hen. As the small chicks will do better if kept away from adult birds and even from older chickens, they should have a separate netted-off run.

Incubator chicks that are to be brooded by a hen should be given to her about the second day after they have been hatched, preferably after dusk.

The mother hen should be prevented from ranging the chicks about in wet grass and a guard should be made against the chickens getting drowned in the drinking-water pan. If the pan is deep and wide, place a brick or



Infra-red dull emitter unit, which is used in the same way as the lamps illustrated above.

piece of wood in it to give a chick that falls in a chance to climb out.

Artificial Brooders

Broody hens will not meet the requirements of a sideline poultry keeper wanting to rear 200 or 300 chicks, and artificial brooders are desirable. Such a brooder is a mechanical device designed to do the work of the mother hen on a larger scale. As a rule, some heating system is used in conjunction with the brooder, but this article is intended for the householder with a few chickens, to whom an infra-red lamp or infra-red dull emitter unit can be recommended. These are used as shown in the accompanying illustrations. Care should be taken to place these heating units, either lamp or dull emitter unit, at a height above the chicks recommended by the manufacturers.

The essentials of brooding have been largely learnt from the hen. The natural actions of a broody mother show that the chicks need to be able to get warm at any time. In addition, they need suitable feed, consisting of both animal and vegetable substances and also minerals; a sufficient supply of vitamins in the diet, such as chicks under natural conditions would get from fresh greens, worms, and insects; facilities for keeping the flock together; and sufficient ventilation. Artificial conditions, as opposed to natural, keep the chicks in one place instead of on the move, so provision must be made for disposal of droppings as completely and as frequently as possible and for protection from enemies and parasites.

These requirements are all of equal importance, with, perhaps, ventilation requiring a little more attention than it might appear to warrant at first sight.

Another essential for successful brooding, though not a part of the mechanics of brooding, is that the chicks be strong, healthy, and vigorous at the start.

Brooder Temperatures

The desirable brooding temperature for young chicks is about that of the mother hen, and she probably warms closely snuggled chickens to about 100 degrees F. In natural brooding, chicks are under the hen only a portion of the time. They can withstand a considerable range of temperature, but must be able to go back at will to a place of sufficient warmth.

In the curtained type of brooder, with added heat, the temperature can be considered ideal when the chicks arrange themselves, especially at night, prone at the inner edge of the curtain with only their heads protruding to breathe the purer air. In the canopy type where no curtain is provided, the correct temperature will cause the chicks to arrange themselves at night in a circle around the brooder, neither crowded nor spread out so far that heat is wasted.

The thermometer is not the important item in judging whether the temperature is correct. More dependence should be placed on the actions of the chicks. Their chirping language will indicate rapidly whether they are comfortable and happy.

Artificially brooded chicks should be trained very carefully at the start. The mother hen is able to call the chicks and inflict her will, so the owner must do what the brooder cannot. Proper brooder habits should be inculcated from the beginning. If the chicks learn to get warm by piling up or huddling in a corner, they are likely to continue that habit. They should be taught where the warmth is. After they have been placed in the brooder they should be examined at frequent periods and, at the least sign of chilling or crowding, pushed gently under the brooder. The training period is short.

Some form of dry litter should be used on the brooder house floor, but it should be of a type that the chicks will not eat, that remains clean under average conditions, and that is loose enough to permit the droppings to fall away from the top surface and moisture to be released readily. Chopped straw has a decided advantage over most other forms of litter. Cleanliness is essential.

Teaching Birds to Roost

The weather at the time of the year will indicate how long the chicks should be kept in the brooder. At about 6 weeks of age the pullets can manage without heat and should be encouraged to perch on roosts. This reduces the danger of crowding or huddling, helps to improve their health, and causes them to develop more rapidly. Training perches should be spaced 3in. to 4in. apart with fine wire netting underneath. If a netting ramp is made from the floor to the front perch, the pullets can easily be driven up to learn to roost and are prevented from scratching in the droppings which fall under the perches.

When they have learnt to roost is the time to change them to roomier quarters for the next rearing stage. This type of rearing shed is commonly called a colony house, and at this stage ventilation is of the utmost importance. A colony house plan can be obtained from the Department of Agriculture.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during May and for the 10 months ended 31 May 1955, with comparative figures for the same month and 10-monthly period of 1953-54, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
May 1955	2,282	102	2,384	—
May 1954	2,741	104	2,845	—
Increase or decrease	—459	—2	—461	—16.204
10 months ended 31/5/55	146,689	2,980	149,669	—
10 months ended 31/5/54	141,301	2,980	144,281	—
Increase or decrease	+5,388	—	+5,388	+3.734

Butter in store at 31 May 1955 was 16,100 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
May 1955	2,995	775	3,770	—
May 1954	4,580	32	4,612	—
Increase or decrease	—1,585	+743	—842	—18.256
10 months ended 31/5/55	76,288	20,556	96,844	—
10 months ended 31/5/54	97,588	219	97,807	—
Increase or decrease	—21,300	+20,337	—963	—0.984

Cheese in store at 31 May 1955 was 27,000 tons

If these figures are converted into butterfat equivalent, there is an increase of 2.630 per cent. in butterfat graded for the 10 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

"Pioneer Nurserymen of N.Z.": A. M. Hale

THIS is basically a biographical book, and is both of historical and horticultural interest.

Even within 100 years many nurseries have developed and disappeared, the heyday of the nursery trade apparently occurring in the early part of this century.

"Pioneer Nurserymen of New Zealand" will be valuable in future as a historical record; it provides food for thought to younger nurserymen and new entrants to horticulture.—*J.P.S.*

New Zealand Horticultural Trades Association (Inc.). 25s.

Canterbury Agricultural College's 75th Anniversary

THE 75th anniversary of the founding of Canterbury Agricultural College was marked recently by a large gathering of old students and leading agricultural educationists. The College opened at Lincoln in 1880 with 8 students on land set aside by the Provincial Government. The College aimed: "To provide a thoroughly practical education in colonial farming at moderate cost and to afford facilities for the study of related sciences."

IN the course of the celebrations the Minister of Education, Mr. R. M. Algie, said that the College was further ahead with its rebuilding programme than any other college in New Zealand. He said that there was nothing better in New Zealand than Hudson Hall, the College's new dormitory block, and the completion of the hall and the refectory were two great landmarks in the history of the College.

Mr. Algie said that he was happy to be able to tell the gathering that plans for the remodelling and renovation of Ivey Hall, the original building of the College, were making steady progress. The building was possibly the oldest between Christchurch and Ashburton and it needed renovation.

A group at the 75th anniversary celebrations of Canterbury Agricultural College: From left, the Vice-Chancellor of the University of New Zealand, Dr. G. A. Currie; the Minister of Education, Mr. R. M. Algie; the chairman of the College Board of Governors, Mr. W. H. Gillespie, M.P.; and the Director of the College, Dr. M. M. Burns.

Unlocking the Storehouse

In the future the College would have an increasingly important part to play. "There is more to come for Canterbury Agricultural College, because the need will be here," said Mr. Algie. "You in the South Island have some 12,000,000 acres of tussock land. Only the scientists can open the door to that storehouse of natural wealth. We cannot greatly increase the production from our normal farm land, so we will have to enlarge the area of land we use. We expect by 1975 to have another 1,000,000 of population. We have got to find a way of feeding them or we shall have to lower our standard of living. The scientist is already unlocking the door of the storehouse through topdressing and stock breeding. The scientist has already told us how to obtain four times the amount of production from the same area of land, and he is going to teach us more in the future."

Some of the old students who attended the celebrations: Standing, Messrs. W. S. Andrews (left) and A. E. Gillingham; seated, from left, Messrs. J. T. Shand, B. Seth-Smith, and G. M. Bassett.

Education and Citizenship

The Director of the College, Dr. M. M. Burns, said that research at the College was secondary to teaching, but there had always been an atmosphere of research there and sufficient research projects in progress for the staff to retain the capacity for dynamic, stimulating teaching.

For 50 years research had been carried on by the College without having any financial assistance. In 75 years grants totalled £135,000 or less than half the annual budget of some of the other important research institutions. It was a magnificent return for a small investment.

Dr. Burns stressed the value of having research institutions near the universities, for then the student gained, in addition to the benefits of education and technical knowledge, the qualities of citizenship that came from close association with fellow students and the staff. Hudson Hall and the refectory would add much to the value of residential life of Canterbury Agricultural College.

Photographs by R. C. Blackmore.

Hobbling Method of Fostering Lambs to Ewes

ONE of the tasks which may take a considerable amount of time during lambing is the fostering of lambs to ewes which have lost their own. Various practices are used and that described here is recommended by Mr. H. S. Stratford, of Tauranga, who used it with marked success for many years. He had much better results with it than with mothering pens or with the common practice of chaining ewes to fences. The feature of Mr. Stratford's method is that the foster mother is hobbled.

MR. STRATFORD used pieces of clothes line (a hank was sufficient for a season) for the hobbles. The ewe is hobbled by placing the rope from the fetlock of the front leg to the fetlock of the hind leg on the same side of the sheep, the length of the rope being such that it allows the sheep to stand in a perfectly natural position. The rope must not be shorter, as this will cause the sheep uneasiness, and she must be made as comfortable as possible. Bowline knots should be tied loosely around each fetlock, but there should not be any loose ends to be trodden on. Slip knots must not be used. The rope may be attached on either side of the ewe.

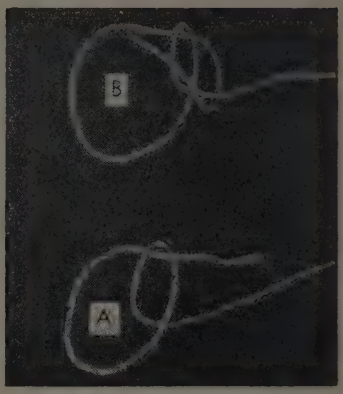
Hobbling the Ewe

It is usually easy to catch a ewe with a dead lamb, as she will remain near where her lamb is lying. When the ewe is caught she should be upended carefully, as she will be full of milk and sore from lambing, and then hobbled. If the lamb to be fostered is within reach, it should be grasped and rubbed against the dead lamb, the ewe being held while this is being done. The dead lamb should be then thrown as far away as possible and later taken right away. A little milk should then be squirted from the ewe on to the head and tail of the new lamb and the lamb given a little drink. This will give it strength and appetite and will relieve the milk pressure of the ewe.

If the lamb to be fostered is out of reach, the ewe will have to be allowed to get up with the hobble on first. She will not move away (she may back a few paces), as she will be too bewildered with the hobble. When the lamb to be fostered has been caught the ewe can be upended again and the fostering routine carried out.

Mr. Stratford does not find it necessary to skin the dead lambs.

When the lamb wants to feed again it is necessary only to place a hand on the rump of the ewe and usually the lamb will start to drink at once and have a satisfactory feed. Often the ewe begins to back away when the lamb tries to drink, but finds she is restrained; meanwhile the lamb takes advantage of her bewilderment and begins to feed from her. This is an indication that fostering has succeeded.



Tying a bowline knot. The knot is begun by looping the rope as in A. The loop must be made with the short end on top and the short end is led in from below, passed under the long end beyond the loop, and then led up round this and passed down through the loop (B).

The operation can be accomplished easily in about 5 minutes. Mr. Stratford says it may be necessary to inspect the ewe and lamb 4 to 5 hours afterward and perhaps place a hand on the rump of the ewe, but usually the hobble can be removed next day and placed in a saddle bag ready for further use.

Important Points

The following are important points:—

1. Put the hobble on the ewe as near as possible to where the dead lamb is lying. Do not try to drag or take the ewe away from this spot, unless it is near a creek, a hole, or some dangerous place where she might fall in or get tangled. She can feed round this spot and will remain near it.
2. Take the dead lamb away before letting up the ewe to smell the live lamb. See that the dead lamb is not left where the ewe can find it.
3. Put a little mark (not a "plaster") on the ewe and lamb so that mother and lamb can be recognised if the lamb strays.
4. Do not foster several sets of ewes and lambs too near each other; it may lead to complications and mismothering.

Mr. Stratford says that in the few instances where fostering was not successful the ewe was usually a maiden 4-tooth or a 2-tooth that had had severe trouble lambing. With obstinate cases he would change the hobble on to the ewe's other two legs to prevent soreness.

Meteorological Records for May

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	60.2	+ 3.9	72.0	36.3	6.96	17	— 0.23	4.44	15	87.3
Auckland	160	60.3	+ 3.7	73.0	42.1	3.78	16	— 1.01	1.36	15	115.3
Tauranga	10	56.7	+ 3.1	70.2	35.1	3.71	16	— 1.42	1.07	30	130.4
Ruakura	131	55.4	+ 4.0	72.9	29.6	3.44	16	— 1.06	0.80	21	111.6
Rotorua	975	53.4	+ 3.2	68.5	30.8	3.34	14	— 1.94	1.20	15	107.6
Gisborne	12	55.6	+ 2.7	75.7	34.1	0.69	9	— 4.08	0.22	19	138.8
New Plymouth ..	160	56.8	+ 3.1	68.0	40.0	10.10	14	+ 4.03	2.29	31	121.1
Karioi	2125	49.1	+ 3.6	71.2	27.5	4.29	16	+ 0.27	1.12	21	
Napier	5	55.6	+ 2.8	74.0	32.1	0.69	6	— 2.65	0.28	15	149.2
Wanganui	72	55.9	+ 2.9	73.7	40.1	6.02	15	+ 2.90	1.60	4	128.2
Palmerston North .	110	53.8	+ 2.8	72.3	33.2	4.71	14	+ 1.39	1.61	4	127.3
Waingawa	340	52.6	+ 3.1	71.0	32.0	3.65	13	— 0.40	1.89	4	136.2
Wellington	415	54.4	+ 3.1	67.2	39.1	8.51	12	+ 3.95	1.72	4	132.4
Nelson airfield ..	5	51.2	+ 2.7	65.5	31.2	8.37	15	+ 5.33	2.01	5	158.8
Blenheim	12	53.2	+ 3.8	73.0	30.4	3.99	12	+ 1.48	1.25	7	162.7
Hokitika	15	51.2	+ 3.0	65.1	34.0	16.19	18	+ 6.91	2.59	4	113.4
Hanmer	1270	48.2	+ 3.4	75.0	25.0	2.83	8	— 1.65	1.69	4	137.2
Christchurch ..	22	50.7	+ 3.1	79.7	28.3	3.29	9	+ 0.44	2.23	4	142.9
Ashburton	323	49.8	+ 3.1	79.2	26.8	2.65	8	+ 0.10	1.30	4	146.3
Timaru	56	49.4	+ 2.6	68.0	30.2	1.46	8	— 0.07	0.64	3	147.9
Alexandra	520	45.5	+ 2.6	73.5	24.5	2.29	8	+ 1.38	0.82	3	144.9
Taieri	80	48.2	+ 2.3	75.7	27.8	2.22	10	+ 0.13	1.17	3	141.3
Invercargill airfield	8	47.6	+ 2.3	68.0	30.9	3.45	16	— 0.29	1.02	3	101.5

Weed Control in Cereals

SUCCESSFUL control of weeds in cereal crops is vitally important to the farmer on arable cropping land. On it largely depends the harvesting of the maximum yield of first-quality grain, the ease of harvesting, and, most important of all, the prevention of seeding by weeds which may be detrimental to the growing of further cereal crops. This article by J. L. Symons, Fields Instructor, Department of Agriculture, Waimate, describes how cultivation and crop rotation practices may be integrated with the use of weedicides to obtain weed control. Though the efficiency of cultivation and crop rotation practices in weed suppression is often affected by weather and soil conditions, weedicides, if properly used, provide a sure method to obtain clean crops, and a combination of both methods is certainly the most economical.

WEEDS of cereal crops may be classified as either annuals or perennials. Annuals cause the greatest concern to farmers, as the seeds of the majority of them are able to remain viable in the soil for many years and then to germinate in late autumn, winter, or early spring before the cereal is fully established and compete with the growing crops for light, food, and moisture. Some annual weeds such as wireweed, dog daisy (or oxeye daisy), and speedwell generally prove troublesome only when a crop is sown under adverse conditions or is subjected to adverse growing conditions. Others such as wild oats, tares, wild turnip, penny cress, cornbind or black bindweed, fumitory, wild pansy, and cleavers can, if the soil is infested with seed, prove troublesome even under ideal growing conditions.

The perennial weeds which can prove troublesome in cereal crops are limited and Californian thistle is probably the only one of any significance.

METHODS OF CONTROL

Two main methods may be used to control weeds in cereal crops: First, clean farming practices, and secondly, clean farming practices assisted by weedkillers.

Clean Farming Practices

The inclusion of a cleaning crop such as rape in the rotation is very useful for controlling such annual weeds as tares and to some extent wild oats in the succeeding cereal crop. Weeds which germinate before the sowing of the crop are killed by cultivation, and any which germinate after the crop is sown are controlled by the feeding off of the crop before the weed seeds ripen. Provided no further weed seeds are brought to the surface by cultivation before the sowing of the cereal crop, a crop relatively free from such weeds can be expected.

Sometimes, especially when a paddock is known to be badly infested with wild oats, the inclusion of a winter fallow in the rotation before the cleaning crop is sown is essential if adequate control is to be obtained. If ploughing is done in late autumn or early winter, the majority of the wild oats in the top 3in. to 4in. of soil can be germinated and destroyed by later cultivation.

The sowing of successive cereal crops should be avoided at all costs if, owing to unforeseen circumstances, an aggressive annual weed has been allowed to seed in the first crop. Such a crop should be followed by a winter fallow and a forage crop, so that the maximum numbers of weed seeds can be germinated and destroyed before a cereal crop is again grown.

HEADING PHOTOGRAPH: A clean crop of wheat will result if weed infestations are checked by correct applications of hormone weedkillers at the proper time.

WEEDS IN CEREALS . . .

The time of sowing of a cereal crop can play an important part in the control of many annual weeds. A typical example of the effect of this factor is often experienced when, owing to the late harvesting of a previous crop or to unfavourable weather conditions, the sowing of a wheat crop is delayed until June or July. Owing to cold soil conditions, a very poor strike is often obtained. Under these circumstances such weeds as wireweed, dog daisy, and speedwell can take control, and the result is an unthrifty, low-yielding crop. A similar infestation of weeds is often obtained in low-lying parts of a paddock which have become waterlogged, or where parts of a crop have been partially drowned out by flooding.

Once these weeds become established there is difficulty in controlling them. Harrowing in spring when soil conditions permit may give some control. Cereal crops, especially autumn-sown wheat, should not be sown until soil conditions permit a reasonably quick germination, even though this means delaying the sowing until early spring.

The harrowing of autumn-sown cereal crops in spring is a useful way of controlling annual weeds which have germinated during winter and early spring. The crop should be given one or two strokes with the tine harrow, depending on the severity of the weed infestation. This work should be done during September, preferably on a good drying day.

Though harrowing may seem to be a particularly severe method of dealing with annual weeds, the cereal crop usually responds well to this treatment and good control of weeds is generally obtained.

Hormone Weedkillers

Hormone weedkillers are often very useful for helping to obtain weed-free crops where control by normal clean farming practices is impossible, or where this method has failed.

Wheat, oats, barley, and ryecorn are all fairly resistant to the water-based hormones. The two main preparations of this type, the salts and amine salts of M.C.P. and 2,4-D, can safely be used under certain circumstances at up to 2lb. per acre acid equivalent. Generally the use of ¾lb. to 1lb. per acre is sufficient to control most annual weeds.

Time of Spraying

When hormones are being used it is important that spraying be done when the cereal crop is at the correct stage of growth. The safe period is when the plants are in the six true-leaf or fully tillered stage, when normally the crop is 6in. to 9in. high. If spraying is done earlier, there is a possibility that the seed spike may be injured and a reduced yield will result. On the other hand, if spraying is delayed to the "shot blade" stage, pollen formation may be prevented and a low germinating line of grain will be the result. Good germination in grain is often essential, especially with barley which is required for malting and for any grain which is required for seed. Considerable damage can also be done to a cereal crop by vehicle or tractor wheels when spraying is carried out at a late stage of growth. In several instances noticed by the writer in which spraying has been delayed

Barley infested with wild turnip. This condition can be avoided by an application of up to 1lb. of acid equivalent per acre of the salts and amines of M.C.P. after the barley has reached the six true-leaf stage.

In wheat the Californian thistle can be sufficiently checked by the salts and amines of M.C.P. applied at up to 1lb. acid equivalent per acre after the wheat has reached the six true-leaf stage.

owing to unfavourable weather the losses in yield sometimes have been estimated to be about one-tenth of the total yield, and generally such losses far outweighed the possible gain in yield due to weed control.

Weeds Controlled by Hormones

The effect of water-based hormone weedkillers applied on annual weeds at the usual rate of ¾lb. to 1lb. per acre varies. Some weeds are susceptible at all stages of growth, others are susceptible only in the seedling stage or before flowering, and others are resistant at all stages of growth.

The annual weeds may be classified as follows:—

Susceptible—Fat-hen, wild turnip, hedge mustard, shepherd's purse.

Susceptible as seedlings—Penny cress, tares, and fumitory (sometimes).

Resistant—Cornbind or black bindweed, wireweed, wild pansy, dog daisy, cleavers, and speedwell. These weeds are fairly susceptible to P.E.G. ester of 2,4-D. This preparation secures satisfactory control of weeds such as cornbind, wireweed, and others of the dock family. Autumn-sown crops can be sprayed with up to 2lb. of acid equivalent per acre and spring-sown crops with up to 1lb. of acid equivalent. This preparation should only be used in preference to the sodium and amine salts of M.C.P. and 2,4-D if difficult-to-kill weeds are predominant.

There are two methods by which Californian thistle, the most troublesome perennial weed in cereal crops, can be kept under control: First, by extensive cultivation during a summer fallow before an autumn-sown crop is sown, or secondly, by the use of hormone weedkillers.

Excellent control can be obtained by the first method on flat ground and in suitable seasons, but it is not widely practised today because of the large amount of cultivation it entails and the subsequent high cost.

Most reliance today is placed on the use of hormone weedkillers, which under normal conditions can give satisfactory control at a very reasonable cost.

The general practice is to spray the thistle in the rosette stage or slightly later with up to 1lb. acid equivalent per acre of the salts and amines of M.C.P. or the amine salts of 2,4-D. The M.C.P. should preferably be used, as sometimes the 2,4-D causes a reduction in the yield of wheat. This dosage will not always kill the thistle, but it is sufficient to give it a severe check and prevent it from interfering with harvesting.

Successful results will not be obtained in open growing, non-flaggy cereal crops such as Cross 7 wheat and barley, unless the thistles are sprayed at an early stage.

Control with Other Chemicals

Preparatory crops may be used to clean the land of weeds before the cereals are sown. If non-hormone weedkillers are used on these crops, usually much cleaner crops result than can be obtained by mechanical methods. Examples of such crops are brassicas and potatoes, both of which tolerate sufficient T.C.A. as a pre-emergence application immediately the crop is sown to keep the crop free of weeds such as wild oats, fat-hen, redroot, pigweed, cornbind, and spurrey. If the land is high in weed seed content, the rate of application should be up to 20lb. of T.C.A. per acre. This method is more applicable to brassica crops than to potatoes, but is of value in the latter crop where unfavourable weather does not allow weed control by cultivation or where it is desirable to control couch-like grass.

The best results are obtained with T.C.A. when this chemical is applied to moist soil and up to ½in. or so of rain follows the application. T.C.A. depends on moisture for activation and is not effective on dry soils.

A suitable rotation would be a brassica crop, sown and treated with T.C.A. in spring, followed by either an autumn- or spring-sown cereal crop. Trial evidence strongly indicates that if the cereal crop was treated with a suitable hormone preparation, weed control would be sufficiently good to stop a build-up of weed seed in the soil. This is rarely achieved where cultivation practices are the only methods.

Importance of Good Husbandry

Too much emphasis cannot be placed on the importance of good farm husbandry before the sowing of a cereal crop to control weeds.

Though this method will not always give full control of all weeds, it will generally ensure a vigorous, healthy crop which under normal circumstances will be high yielding. Any weeds which prove aggressive under such conditions can usually be easily controlled by hormone weedkillers; in preparatory crops such as brassicas they can be controlled with T.C.A.

Trees on the Farm

Tree Growing on Sand Dunes

By W. H. Jolliffe, Officer-in-charge, Extension Forestry, New Zealand Forest Service

LONG stretches of the west coast of the North Island and other small areas of both islands are composed of sand. Some of it is under control by the careful use of grass or by a cover of marram grass and other sand-inhabiting plants, but much of it is more or less bare, even to the desert stage. This huge area, assessed not long ago at 290,000 acres, can be put to use, if not for pasture then for the growth of trees.

BEFORE trees can be planted in sand the sand must be stabilised by the growth of sand-loving plants so that the young trees will not be overwhelmed or exposed by subsequent wind blows. If the area borders the coast, the first work will be the building up of a protective barrier—the foredune—with brush fences parallel to high-water mark. When the first row becomes buried with sand another fence a little further back is erected and so on until the dune is 15ft. to 20ft. high.

The usual method of fixing the sand is by the planting of marram grass, often in conjunction with the sowing of yellow lupin seed. The marram grass is planted at spacings of 2ft. x 2ft. to 4ft. x 4ft., depending on the degree of exposure to wind. The planting stock is dug from 2- or 3-year-old clumps, trimmed with a sharp spade to 10in. to 12in. long, and tied into convenient-sized bundles. Into each spade hole about three rooted pieces are inserted and well heeled in. Planting on dunes is done on contours and not in straight lines to avoid the formation of wind funnels, though this precaution is unnecessary on moist flats.

In exposed situations the planting of marram grass should be accompanied or followed by the sowing of seed of yellow lupin. This legume combines with the marram grass to form a very dense protective cover and at the same time it enriches the soil by the addition of nitrogen and humus.

Once planting of a sand area has begun all stock must be kept off it. Later, fire becomes the chief menace to reclamation work, especially as dunes have come to be regarded as public playgrounds. In addition to watchfulness against trespassing stock and the outbreak of fire it is necessary to inspect the area regularly for any blowouts after heavy winds. Gaps must be plugged with short lengths of permeable fence before they can develop into major rifts which can undo a lot of painstaking work. Until

Below—Marram grass planted in sand (and now in second year) is the first step in sand fixation before tree planting.

sand dunes are finally fixed with fairly durable forms of growth perpetual vigilance is required; the alternative is to leave unproductive many valuable acres.

The Next Step

Two to 4 years after the planting of the marram grass the sand should be sufficiently stable to permit tree planting with safety. The amount of profitable tree growth depends on the degree of protection from strong, salt-laden winds afforded by the foredune. Along the west coast of the North Island there is always a belt of varying width where the trees are purely protective and not likely ever to have a timber value.

Where marram grass alone has been used to fix the sand, space for the trees can be cleared with a sharp spade, but where lupin occurs with marram grass planting lines have to be opened, either by cutting with a slasher or by crushing with a tracklaying tractor. In the latter method the tractor is driven forward and back over the area so that the near track on the back trip follows in the off-side track on the forward trip or vice versa.

The best planting tool in sand is a spade. Lines made with a tractor will be a little over 6ft. apart; if lines have to be hand cut, 8ft. or 9ft. apart saves a considerable amount of work and the plants can be put in at, respectively, 6ft. or 5ft. apart in the lines. Such spacings will, of course, entail thinning when the trees are 8 to 12 years old, depending on the species.

Suitable Species of Trees

There are not many species of trees which will tolerate salt-laden winds. The most tolerant of those ordinarily used in New Zealand is macrocarpa (*Cupressus macrocarpa*). Others which can be grown are radiata pine (*Pinus radiata*), Corsican pine (*P. laricio*), prickly coned pine (*P. muricata*), maritime pine (*P. pinaster*), and *Robinia pseudacacia*.

Protection

Trees growing on sand exhibit great resistance to wind blow. So deep do their roots go that they are more likely to lose their tops in a gale than to be uprooted. Another result of this deep-rooting habit is that they rarely suffer from drought.

Protection against fire is most effective if the stand is bounded by clean paddocks. This form of protection is more desirable on sand country than on other farm land, because it is much more difficult to maintain bare firebreaks in sand. In fact where firebreaks are necessary they must be clothed with some plant which will not carry fire and yet will stop the sand from blowing. Plants which are suitable include ice plant (*Mesembryanthemum*) and New Zealand spinach (*Tetragonia*).

Radiata pines planted in sand at Tangimoana, on the west coast of the North Island in Manawatu County. The tree being measured is 25 years old and 13in. in diameter.

Farm Management Survey in the Southern Maniatoto Plain

SITUATED in a large basin surrounded by mountain ranges the Maniatoto Plain forms an extensive area for sheep farming in a healthy environment for both man and stock. A farm survey of the southern part of the plain was carried out by three officers of the Department of Agriculture, R. C. Stuart, Agricultural Economist, Christchurch, H. Tocker, Research Officer (Farm Management), Christchurch, and A. H. Mouat, Farm Economist, Dunedin, and in this article they set out the results of the survey, a salient feature of which is the part lucerne can play in increasing the stock carrying capacity of the Maniatoto Plain. The article will be concluded in next month's "Journal".

THE Maniatoto Basin is of low relief and is surrounded by high ranges. The area is mostly flat land, with occasional river terraces breaking the level aspect of the plain, which slopes gently toward the Taieri River. The Maniatoto Plain is not as uniform as the depositional plains of Canterbury, and a little undulating and rolling land occurs at infrequent intervals through the area. The area of this survey lies south of Ranfurly and is triangular, being bounded on two sides by the fault ranges of the Rock and Pillar Range (4000ft.) and Rough Ridge (3000ft.). At the head of the basin near Paerau the surface of the land is more undulating, but further down the valley the terraces have formed larger areas of flat or gently sloping land. Nearer the ranges which enclose the basin the slope of the land becomes more pronounced until in the lower hills of the ranges it is too steep to plough. The drainage pattern of the basin shows the lie of the land to be toward the Taieri River, and the meandering course of that river shows the gentle fall of the land from the head of the basin at Paerau to the lowest point near Waipiata.

The parent materials give rise to and are the main soil-forming factors of the various soil types found in the basin. To the north there are the greywacke mountains of the Kakanui Range, Mt. Ida, and Mt. Kyeburn, to the south-west the mica schist formations of Rough Ridge, and to the south-east the mica schist of the Rock and Pillar Range. The influence of these parent materials of the surrounding highlands is reflected in the soils of the plain, where deposition of the weathered rock of the uplands overlies the sub-stratum. The complex soil pattern is due to this deposition of material from highlands of different rock formations.

In the formation of the plain the sediments in the centre are finer than those on the margins and near the hills. There are three well-marked terrace levels, with the highest and oldest level at the foot of the surrounding ranges and the lowest and youngest level along the present valleys of the Taieri River and its tributaries. Tertiary sediments underlying the alluvium are salt bearing and occur throughout the basin. In some places the sediments are exposed, normal erosion having removed the thin cover of alluvium.

Soils

Three main categories of soils are recognised according to the nature of the parent material:—

1. Soils developed on greywacke alluvium derived from the northern highlands.
2. Soils developed on mica schist alluvium derived from the other highlands.
3. Soils developed on tertiary gravels, grits, sandstones, silts, and clays.

The general picture of the soils of the area is that of recent soils

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HEADING PHOTOGRAPH: The Maniatoto Basin is of low relief and is surrounded by high ranges. This is a view across the upper part of the basin from the lower slopes of Rough Ridge toward the Rock and Pillar Range.

deposited over the plain with gravels, sands, and silts evident on the surface and presenting a droughty appearance, as drainage is free through these layers of alluvium. The tertiary sediments where they are exposed on the surface give rise to silt loam and clay loam soils which are retentive of moisture. The recent to young meadow soils in the valleys of the Taieri and its tributaries have a generally high water-table and are used for cattle grazing. Farmed in conjunction with the adjoining high terraces, these wet soils play a big part in management of some farms in the dry summer.

Climate

The Maniatoto Basin is sheltered from outside climatic influences by the high surrounding mountain ranges. About the lowest point of altitude on the plain is at Waipiata (1180ft.), in the north-east corner of the survey area, and a large part lies between 1300ft. and 1400ft.

On the hill slopes the annual rainfall averages from 20in. to 25in. and on the plain it is under 20in. Average rainfalls for places within the survey area are:—

Ranfurly, 19.11in. (average over 8 years)

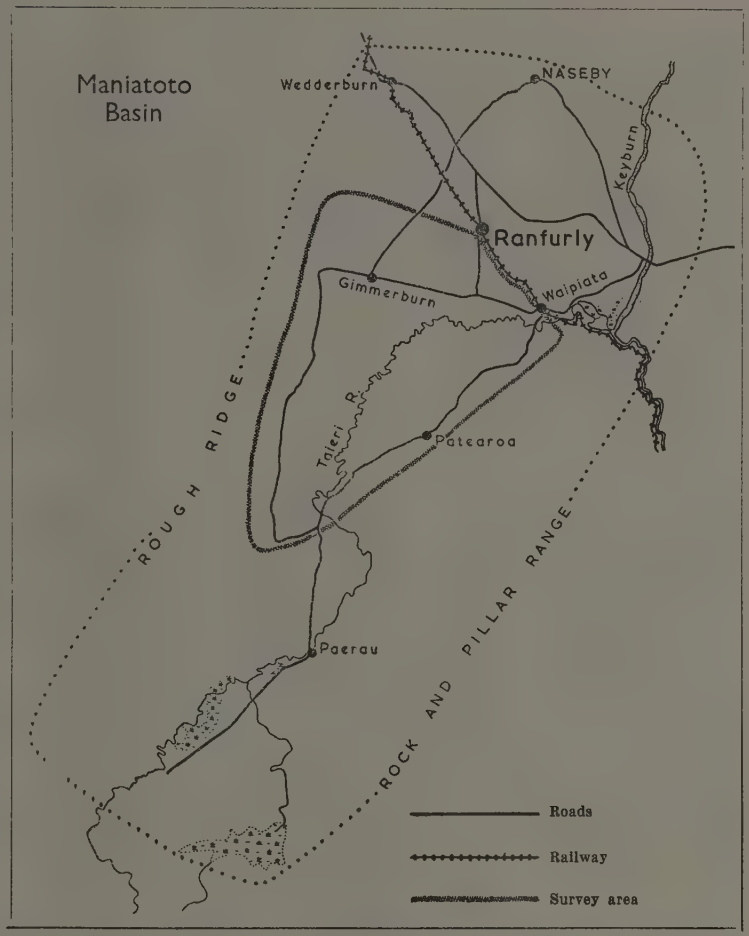
Patearoa, 14.94in. (average over 24 years)

Waipiata, 16.81in. (average over 36 years)

There is some evidence that the rainfall in the Gimmerburn district is less than the lowest recorded at these stations.

Most of the rain falls during summer, when surface heating is at a maximum. Over 40 per cent. of the annual

FARMING ON SOUTHERN MANIATOTO PLAIN



Below—Because of the low effective summer rainfall on the plain some farmers who are close to the Taieri River have installed irrigation schemes. That shown is a private scheme.

Water supply for stock is generally inadequate. The Taieri River and intermittent tributary streams are the main sources, supplemented by earth dams, lagoons, and well bores. Upper—Windmill pumping to troughs. Lower—Natural depression filled by rain-water and irrigation water.

fall is from December to March. The efficiency of the low rainfall is reduced by drying north-west winds and high temperatures of over 90 degrees F. Much of the summer rain comes in heavy convectional downpours and the average number of rain days is low, with the drier stations recording only 80 rain days and other stations up to 115 rain days a year.

The number of sunshine hours in the year is high at about 2000, but during the year more than 150 ground frosts are recorded on the plain. Hard frosts (sometimes 20 degrees or more) occur during winter and light frosts on many clear nights in summer. In winter the plain is often submerged for days under a thick layer of cold-radiation fog, but above this the sky is clear, so that the hill slopes and the higher Styx Valley are relatively free from fog. The average range of temperatures from summer to winter is large by New Zealand standards at 22 degrees F. From mid-April to mid-October low temperatures severely restrict plant growth, and the dormant period and the growing season are each about 6 months long. In summer growth of pastures and crops is determined by availability of water.

Drainage

Under the conditions of low rainfall and dryland farming natural drainage is sufficient. The application of irrigation water introduces the problems of underground seepage and water-logging of low-lying parts, and in these circumstances a drainage system is required to lead off excess water.

Responses to Topdressing

On the soils derived from greywacke alluvium good responses to superphosphate have been obtained, especially where irrigation water is available or on low-lying parts without irrigation. The lime status is maintained with light dressings.

Soil types of schist and tertiary material show doubtful responses to superphosphate and lime, but the area irrigated is very small on these soils. No responses to potash or molybdenum have been observed on any soils of the plain.

Water Supply

Water supply is generally inadequate and this is the reason for the poor subdivision of many farms. The Taieri River and intermittent tributary streams and springs are the main sources. Supplies are supplemented by earth dams, lagoons, and well bores, but some of the well water is unsuitable for stock, being brackish.

Vegetation

A century ago in the absence of grazing animals the natural landscape displayed a thick cover of tussock vegetation over the plain and surrounding hills, with isolated patches of scrub including matagouri and

speargrass in the gullies. Burning of the tussock, cultivation and overcropping, overstocking with sheep, and infestation with rabbits have changed the vegetation from a tussock grassland to an inferior association on the plain and to a depleted tussock cover on the hills.

On the arable soils of the plain a large area that was cropped for cereals in the past has reverted to *Poa pratensis*, which is widespread on the plain. In recent years part of this dryland area has been reploughed and sown to lucerne, mainly for grazing sheep. On some of the stony terraces much of the land is still uncultivated

At right—Much of the lower slopes of the Rock and Pillar Range, which forms the eastern boundary of the Maniatoto Basin, is bare and depleted and recovery of vegetation on this hill country is slow.

and remains in an inferior tussock association.

Of the weeds, fat-hen is a problem with both spring and autumn sowings and it appears that the high population of fat-hen seed in the ground is a legacy from the early days of regular cropping. Seasonal growth is limited by altitude and climate to 6 to 7 months. Spring growth begins late (October) and by late April, with the onset of frosts, growth has ceased. The growing period is further reduced by the dry spells which can occur throughout the season.

On the hill country of the northern slopes of the Rock and Pillar Range the lower slopes are mostly bare and depleted, with a cover of scabweed and patches of Californian thistle and stinging nettle in the moist hollows. The higher and flatter tops have an open cover of tussock (*Poa caespitosa*) and snow tussock. Recovery of the vegetation on this hill country is slow, but some improvement is made through spelling and aerial oversowing of suitable grasses. On the easterly

At right—On the eastern slopes of Rough Ridge, which is the western boundary of the Maniatoto Basin, an improvement in the cover has been noticeable recently after destruction of rabbits.

slopes of Rough Ridge the improvement in the cover has been more noticeable recently after rabbit destruction work and there is now appearing a proportion of blue wheat grass (*Agropyron scabrum*).

Where irrigation is available some good pastures have been established with perennial ryegrass, white clover, Montgomery red clover, and crested dogstail.

Apart from a few plantations of trees there has been little attempt to establish shelter for stock, but some shelter belts have been established around homesteads. The early settlers'

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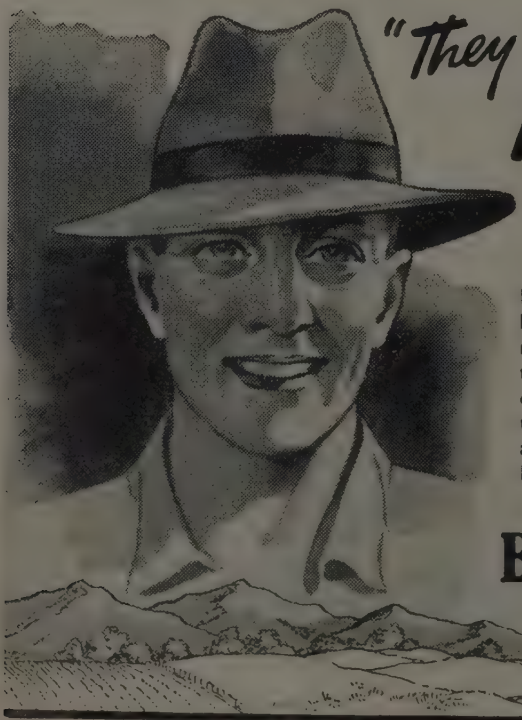

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description of the plain as a treeless expanse is still generally true.

History of Farming

The first occupation of the plain by runholders took place in the late 1850s. Natural physical features, such as rivers and mountains, defined the boundaries of the huge holdings of several thousand acres. Merino sheep were brought in and the flocks rapidly increased. The burning of tussock in early spring to induce new sweet growth for sheep was a common practice.

Gold was found in the district in the middle 1860s and this brought an influx of miners to Maniatoto. The demand for food was great and the runholders provided meat and started to grow cereal crops on the plain. Wheat was widely grown and on the virgin soil the first yields were good, but after several years of continuous cropping the original fertility was exhausted and yields became poorer.

The demands of the miners for land and the enthusiasm over farming possibilities led to the subdivision of the plain near the settlements into relatively small units (about 320 acres). The railway was completed and further encouraged subdivision. These small farmers were soon in difficulties after the drop in soil fertility and the exodus of the miners when the gold ran out. Some farmers overcame these difficulties by adding other small holdings to their own and thus establishing economic units. The aggregation of these holdings has been common and today a farmer may own 5 to 10 scattered holdings on the plain. Some properties have been in the possession of the present families for three generations and few land transactions have permitted people outside the plain to settle there in the past 40 years.

Rabbits appeared in the 1870s and soon became a menace. With the rise of the rabbit population there was a steady fall in the carrying capacity for sheep. Rabbit boards were constituted in the area in 1943 and 1948. Because of the difficulty of getting rabbiters during and after the war and the lack of co-operation by some farmers, it took some years for the work of these boards to be appreciated. The infestation on the hill country surrounding the basin was very severe in some places and the sunny slopes were denuded of their tussock cover and scabweed took its place. In recent years the successful work of the boards has been reflected in a marked decline in the rabbit pest, which has been followed by an improvement in the amount and quality of the vegetative cover. In some cases where this improvement in growth has occurred sheep numbers have been increased and some cattle are also carried. On other properties where stocking has not been increased better growth of pastures is apparent. The greater part of the basin on the flat is outside the rabbit board districts, as the infestation is not high and farmers are able to carry out control measures.

Where irrigation water is available some good pastures have been established. Water from a contour race is here being put on to pasture by plastic siphons.

Under the present system of farming there are large holdings, but the sheep carrying capacity is low and conditions are healthy for stock. Wool production per sheep is excellent and a large percentage of the lambs are drafted fat off their mothers at good weights.

There is little cultivation and growing of winter feed compared with other sheep farming areas in South Otago and North Otago. Lucerne hay is the chief crop for winter feed and a small area of turnips may be grown for the hoggets mainly, with any surplus going to the ewes. Lucerne and young pastures are used to fatten lambs and a few farmers use green-feed crops or turnips for this purpose.

Most farms on the plains have a block of hill country on which the vegetation is sparse but improving gradually with the reduction of the rabbit pest. This run country is particularly valuable in the dry autumn period between weaning of the lambs and tupping, when the ewes are shifted on to the higher grazing to spell the flats for winter. Some farms are wholly on the plain and on these farms the stocking rate has to be watched more carefully, as there is less spelling of the pastures during autumn.

Small irrigation systems on some farms have given more security in the grazing of flocks, allowed for an increase in stock numbers, improved ability to fatten lambs, and permitted the buying in of store lambs for fattening.

Scope of Survey

The survey was restricted to the Maniatoto Plain south of Ranfurly and within this area all farmers were visited for details of their holdings, methods of farming, production, and financial returns. The 53 farms have a total acreage of 68,531 acres on the plain and a further 141,867 acres on the surrounding ranges of run country. As the hill tussock blocks are limited in their usefulness to a short period each year for grazing, the acreage of plain held by each owner has been used as a basis for comparisons between groups of farms.

The farm survey was carried out in the winter of 1953 and the figures obtained refer to the 1952-53 season.

Land Tenure

Of the total of 210,198 acres covered in this survey, 182,340 acres (87 per cent.) are held on leasehold tenure and the remaining 27,858 acres (13 per cent.) are freehold. The bulk of this leasehold land is on the tussock-

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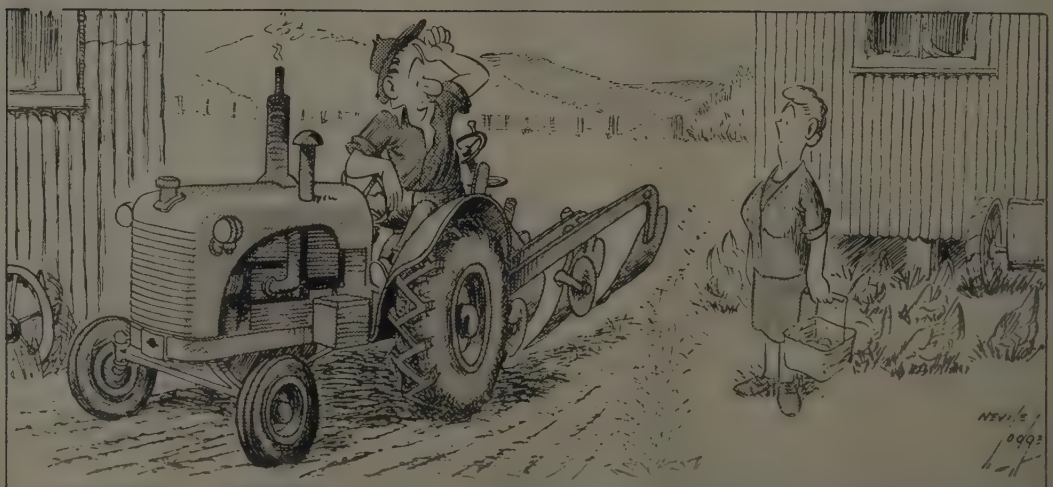

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Lack of shelter for stock and round homesteads is common in the Maniatoto Basin, though in some instances adequate provision has been made, such as for this home at Waipiata.

covered hills, but even on the plain more than half the land is leasehold. In the area of plain covered by the survey approximately 40 per cent. of the acreage is freehold, 55 per cent. is lease in perpetuity, and the remaining 5 per cent. comprises small grazing runs leased on a 21-year term.

Size of Properties

The average size of properties in the survey, including the run country, is 4000 acres, two-thirds of which is hill country and a third on the plain. Of the 53 properties 37 (almost 70 per cent.) are less than average in size, but the seven largest properties are over 7000 acres. The acreage on the plain is the most significant part of a farm area and on this basis the following table shows the distribution of the 53 farms.

Below—Large fields are a feature of the Maniatoto Basin, but on farms where improved pastures and lucerne are being established subdivision is taking place.

TABLE I—FARM SIZE BASED ON AREA OF PLAINS IN EACH PROPERTY

Size of holding (acres)	No. of properties
Under 500	4
500 and under 1000	14
1000 and under 1500	18
1500 and under 2000	12
2000 and under 2500	0
2500 and under 3000	4
3000 and over	1
	53

The average acreage of plain in each property is 1300 acres, but 32 farms have less than this.

Size of Fields

At present with so much of the area in old pastures and native grasses of low carrying capacity large fields are common. Farms that are being improved with the establishment of lucerne and other pastures are being subdivided to make smaller fields.

The amalgamation of holdings has increased the size of the individual farm properties over the years and today a few farms comprise 10 or more separate holdings; the average is 4.4 holdings to each property. Many of these holdings adjoin, but a number are separated by a few miles from the homestead block. About the borders of the plain holdings of run country adjoin holdings on the plain, but with some properties the hill country may be up to 15 miles from the homestead.

Land Utilisation

The hill country of sparse tussock and associated vegetation is used as run country mainly in autumn to spell the pastures on the plain. Details of the land utilisation on the plain are presented in Table 2, in which the outstanding feature is that 94 per cent. of the plain area is in grass and lucerne.

The small acreage sown to new grass or lucerne each year is only 3 per cent. of the area, and about the same percentage is in winter feed crops and greenfeed for ewes and lambs. These

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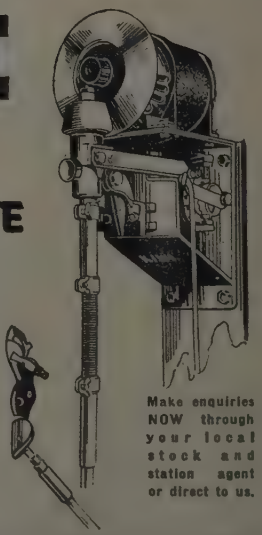

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Lucerne hay is the chief crop for winter feed.

TABLE 2—LAND UTILISATION OF THE MANIATOTO PLAIN AREA

	Acres	Per cent.
Sown pasture under 1 year old	1,274	2
Sown lucerne under 1 year old	1,077	1
Sown pasture over 1 year old	4,723	7
Sown lucerne over 1 year old	7,834	12
Other grazing	49,394	72
Winter forage	1,027	1
Greenfeed	1,134	2
Lamb-fattening crop	80	—
Fallow	1,988	3
Total area	68,531	100

figures show the small dependence on supplementary feed crops, but on many farms great reliance is placed on lucerne to provide hay for winter, to fatten lambs in summer, and for general grazing by the flock. Of the grazing land on the plain 19 per cent. is in sown pastures and lucerne over 1 year old; the remainder (72 per cent.) is in sparse tussock vegetation and *Poa pratensis*.

Including the hill country, which is used for only a few months, usually in autumn, the area for grazing shown in Table 3 shows the relationship of the four classes of grazing available for the sheep. The opportunity for farm improvement is reflected in the large acreage of unimproved pasture, and most of this 49,394 acres is ploughable.

TABLE 3—AVAILABLE GRAZING ON FARMS IN SURVEY

	Acres	Per cent.
Hill tussock	141,867	67
Unimproved pasture	49,394	23
Sown pasture	5,997	3
Lucerne	8,911	4
Total available grazing	206,169	97
Total area of properties	210,198	100

Lucerne

The important place of lucerne in this dryland farming area is evident from the figures showing a greater acreage in lucerne than in sown pasture. The soils of the plain are particularly suited to the growing of lucerne, which will stand up well for 20 years and more.

It is common practice to sow lucerne in the rotation lea, turnips, turnips, lucerne. Good results are obtained from spring and autumn sowings, though with spring sowings weeds may be more troublesome. A growing practice is to sow lucerne in January with 6oz. to 8oz. of turnips for late winter or early spring feeding. Autumn sowings with a greenfeed crop are also made.

When lucerne is sown with turnips, 6lb. to 8lb. of lucerne seed is drilled on rolled ground; when it is sown with greenfeed the crop is first drilled and the ground is rolled firm for the broadcasting of the lucerne seed, after which a light harrowing is given. Lime or fertiliser is seldom used when lucerne is sown and practically no topdressing of established stands is done.

Lucerne is used chiefly for grazing, with about 30 per cent. being cut for hay, usually only one cut being taken annually.

Even in the first year after sowing stands are grazed quite hard and come to no permanent harm, as recovery seems to be quite rapid. Many farmers are now sowing a few pounds of cocksfoot with the lucerne or are sowing a part of the paddock in a grass mixture or a few drill widths of grass round the lucerne stand.

Once lucerne has established it becomes, with reasonable management, virtually permanent, as competition from weeds and weed grasses is limited under the prevailing climate. After frequent grazing of the lucerne the topsoil may become consolidated and it is necessary to use a suitable type of harrow or, in very bad cases, the stiff tined grubber to loosen the surface during the dormant season. This treatment does little or no damage to the lucerne and weeds are checked from gaining a hold while the lucerne is not producing.

In this area, where pastures are so short lived, grazing from lucerne or lucerne in association with grasses is the key to increased production.

Pasture Establishment

A well-established rotation for the plains is to plough old pasture for a turnip crop or greenfeed crop and to resow to grass with a light seeding of turnips. On some farms the practice is to sow a greenfeed crop after the first turnip crop and then to sow down to grass. The seeds mixture is usually drilled in 7in. drills, but sometimes it is broadcast.

The general mixture includes 1½ bushels of perennial ryegrass, 2lb. of white clover, 2lb. to 3lb. of either broad red or Montgomery red clover, 4lb. to 6lb. of cocksfoot, and occasionally up to 4lb. of crested dogstail. Sowing may take place from spring to autumn. Frequently turnips are included as a cover crop, but lime or superphosphate is seldom applied at sowing. Many good pastures have been established by sowing the seeds mixture with 6oz. to 8oz. of turnips in December or January. When the turnips are fed off in early winter the trampling of the sheep consolidates the new pasture, with good results apparent in the ensuing spring.

TABLE 4—LIMING AND TOPDRESSING

*Area of sown grassland	5,997 acres
Lime	
Amount used	952 tons
Area limed	1,040 acres
Percentage of sown grassland limed	17 per cent.
Phosphatic fertiliser	
Total applied	2,933cwt.
Area topdressed	1,965 acres
Percentage of sown grassland topdressed with phosphatic fertiliser	33 per cent.

* The acreage of sown grassland is only 2½ per cent. of the available grazing.

New pastures strike readily in these soils of natural fertility, but with the low organic content the ground dries out quickly with the result that pastures under dry-land management last for only 2 or 3 years. Apart from the irrigated pastures, where responses are marked, farmers are reluctant to apply lime and fertiliser to their grassland. Two-thirds of the sown pastures receive little or no treatment during their productive life. Of the 53 farmers in the survey only 16 applied lime and 14 applied fertiliser in the 1952-53 season.

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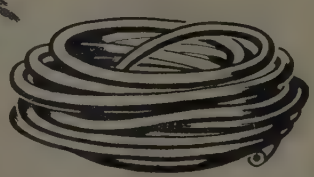

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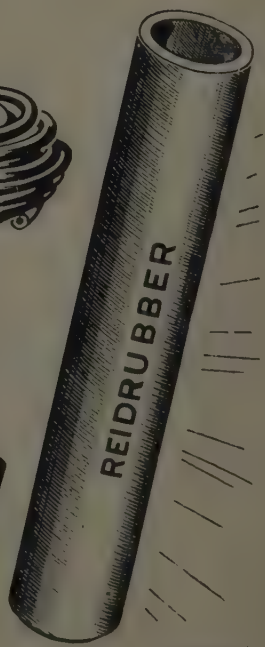

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New Season Begins in August in Many Home Gardens

WHETHER gardening is done by the keen gardener for pleasure or by the not-so-keen gardener as a duty, home gardeners usually feel a sense of urgency to plant or to sow in August. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses work in the vegetable garden in August.

HARDY subjects can be sown in practically all home gardens in August, but the extent of sowing should be largely governed by the local climate. Each kind of plant grows best within a certain temperature range. Plants can grow, within limits, outside their optimum temperature range, but they do not grow well, and as in many districts temperatures in August are for a great part of the time below the optimum for the good growth of many vegetables, there is likely to be greater loss from August sowings than from sowings made later.

In most districts, therefore, only comparatively small sowings should be made of each of the vegetables that are hardy in the district. Most of the common vegetables are hardy, the principle exceptions being plants such as cucumbers, pumpkins, sweet corn, and tomatoes, though the condition of hardiness is also determined by species or variety. Plants that are hardy in one district are not necessarily hardy in another.

Temperatures

One of the first considerations in deciding whether to sow early in the season is temperature and a knowledge of the optimum growth temperatures assessment of prospects of successful production.

The following are the optimum temperatures for germination and growth of plants to be sown is helpful in the of the commoner vegetables:—

	Degrees F.		Degrees F.
Beans (French or snap)	65 to 86	Melon ..	75 to 86
Beet ..	46 to 77	Onion ..	52 to 86
Cabbage ..	46 to 50	Parsley ..	50 to 65
Carrot ..	46 to 65	Peas ..	38 to 65
Cauliflower	50 to 77	Radish ..	52 to 86
Cucumber .	75 to 86	Spinach ..	38 to 46
Lettuce ..	39 to 75	Tomato ..	65 to 86

Growth is generally very slow at temperatures lower than 46 degrees F. and even the seed of plants which grow well in relatively cool conditions germinates only slowly at 50 degrees. Seed of most hardy plants germinates vigorously at 60 degrees, but seeds of plants such as tomatoes, melons, and cucumbers need a temperature of about 70 degrees F. to enable them to germinate vigorously.

If seedlings of some plants, notably cabbage, beet, and celery, are subjected to excessively low temperatures for a fortnight or more, premature seed head development (bolting) is likely. It is not wise, therefore, to sow too early if there is a doubt about the weather.

Seed Protectants

Limited protection can be given seed by dusting or coating it by shaking it in a tin with a small amount of a suitable protectant, though no seed protectant can give complete protection against all soil-borne disease.

Greatest loss of germinating seed is caused by the group of disease organisms known as damping off

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HEADING PHOTOGRAPH: Though the first sunny days of August usually induce gardeners to make sowings, temperatures in August are for a great part of the time below those needed for good growth. Only comparatively small sowings should be made of vegetables that are hardy in the district. Green and Hahn photo.

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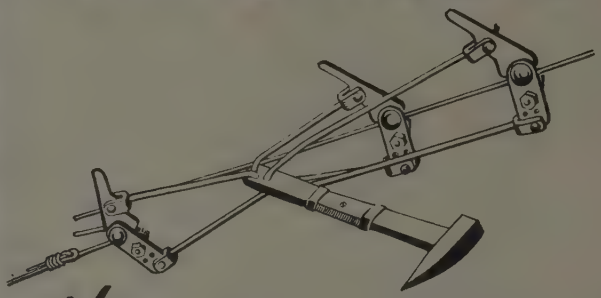

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diseases, the most important of which are species of *Phythium*, *Rhizoctonia*, and *Fusarium*. They are present in practically all soils and usually thrive under conditions unfavourable for seed germination, such as wet soil and cool weather, which allow them to invade the seed or young plant and decay it. The extent of loss where the seed is coated with protectant usually depends relatively on the extent to which the soil is infected.

Some very effective and relatively new fungicides are now available, such as phygon, thiram, and captan, which may be used as seed protectants instead of the more commonly used materials such as copper compounds. These may be used for dusting seeds of beans, beetroot, carrots, cucumbers, lettuces, peas, spinach, silver beet, and tomatoes.

Zinc oxide may be applied in the same way as copper compounds for treating seed of beetroot, brassicas, carrots, lettuces, onions, parsnips, spinach, and tomatoes. Organic mercury dusts are suitable for seed of brassicas, beet, pumpkins, marrows, etc., and spinach, and non-metallic dusts, such as spergon or tetroc, are recommended for pea, bean, maize, carrot, cauliflower, and lettuce seeds. None of these, however, gives more than limited protection, because as a seed germinates and the seedling develops it pushes out more tissue which is not covered by the chemical protectant.

Where temperature, nutrients, moisture, and the physical characters of the soil are favourable for growth the seedling usually grows fast enough to resist the attack of most of the weaker soil organisms, but under unfavourable conditions of growth the newly developed stem and roots may be invaded, giving rise to one or more of the several types of stem rot, foot rot, or root rot.

Sowing under Glass

In some districts frost-tender subjects, such as tomatoes, cucumbers, marrows, pumpkins, and melons, can now be sown under glass to be ready for setting out when frost danger is past. Though the time taken to produce good plants for planting in the open varies according to the treatment given, tomatoes started in warm, favourable conditions usually take about 6 weeks and the other subjects mentioned about half that time to reach a suitable state for planting out.

Cold, unfavourable conditions retard and warm, favourable conditions accelerate the rate of development, and sowing must be governed by the facilities available and the incidence of damaging frost. It is not advisable to have plants ready too early. Date of planting out varies from about mid-October to late October in some northern districts to the second week in November in many southern districts.

[*Green and Hahn*

Green crops such as oats (above), barley, and lupins are invaluable for improving the physical condition of the soil.

Asparagus

In most districts August is the preferred month for setting out plants to establish a new bed of asparagus, as usually ground conditions and the plants or crowns to be set out are in the most suitable condition then. One-year-old seedlings are usually preferred, as they transplant better and establish more readily than 2-year crowns, which are considerably larger and therefore more subject to damage during transplanting. Crowns can be set out about 8in. below soil level and the roots spread evenly over a small mound drawn up in the bottom of the trench.

The top bud should not at first be covered with more than 2in. of soil, as a young plant is liable to be smothered and retarded if deeply covered before it has become established and sufficiently strengthened. Single rows are preferred commercially, though double rows are often planted in home gardens. Crowns should be placed about 18in. apart. Rows should be at least 42in. apart for single rows.

Cutting

The period during which asparagus can be cut varies greatly according to the bed and may range from about 6 weeks to about 10 weeks. The productiveness of the bed will be greatly curtailed by too-early cutting. Only if the growing season is long and the plants are well established should a cutting (of not more than 2 weeks) be made in the third year from time of planting the seed (the second year after setting out yearling plants). In the fourth year the cutting period should not exceed about half the season or about 4 weeks. Thereafter cutting can continue each year for from 6 to 10 weeks according to season of growth and vigour of the bed.

Built-up or raised beds are an advantage where the soil is shallow or the drainage poor. Good drainage is essential and the site on which it is intended to establish a bed should first be dug deeply. All perennial weeds should be removed and where it is obtainable a good dressing of organic manure such as farmyard or stable manure or compost should be applied. A complete fertiliser (one containing nitrogen, phosphoric acid, and potash) is also advisable on most

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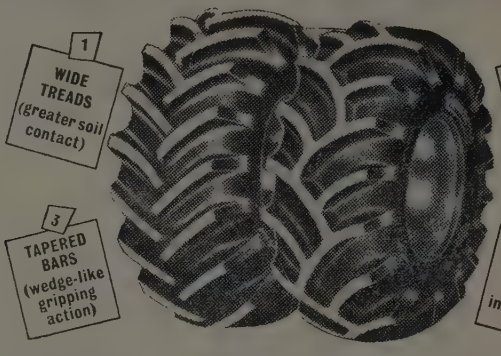

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well-worked home garden soils. It should be applied at up to about 4oz. to 5oz. a square yard.

Popular varieties are Mary Washington, Martha Washington, Connovers Colossal, and Paradise. K.B.F. is a comparatively new variety which appears to have a good future.

Broad Beans

Broad beans can still be sown in most districts. The soil should be deeply dug and fairly well supplied with organic material such as compost or stable or farmyard manure. If additional plant food is required, a dressing of up to 3oz. of superphosphate to the square yard should give good results.

Beans should preferably be sown in double rows with the seed zig-zagged 4in. to 6in. apart and covered 1½in. to 2in. deep in the bottom of a drill about 3in. deep. One quart of seed will sow 60ft. to 100ft. of single row.

Good varieties are Early Long Pod and Broad Windsor.

Onions

The production of main-crop onions from autumn-sown seed is confined mainly to the North Island, and where the ground is in suitable condition plants from autumn sowings should be set out without delay. Ground where onion plants are to be set out should preferably have been prepared some time in advance by deep digging and liberal manuring with organic manure. A complete fertiliser containing a high percentage of bonedust (which contains slowly available phosphoric acid and a little nitrogen) has given good results on a wide range of soils and can be applied at the rate of about 3oz. to 5oz. per square yard.

As the onion is sensitive to excessive soil acidity, lime may be necessary. An annual dressing of about 2oz. to 4oz. a square yard should give satisfactory results in most districts. It should be reduced in districts where rainfall is low.

Plants can be set out 3in. to 6in. apart in rows 12in. to 15in. apart. Varieties include early maturing, giant, and long-keeping types and in the planned garden where the flavour of onions is appreciated some of each kind should be planted. Plants are usually available from seedsmen in districts where it is usual to set out plants at this time of year.

Parsley

To ensure adequate supplies of parsley, seed should be sown twice a year in most gardens—in spring and again in autumn. The plant is a biennial, that is, it goes to seed the second year, but unless conditions are especially favourable, germination is usually slow and unless two sowings are made, there may be a break in supply.

Parsley responds well to rich, well-drained soils, and where the soil is lacking in organic matter a dusting of blood and bone lightly forked in at the rate of 2oz. to 3oz. to the square yard usually gives good results. Seed can be sown in rows or broadcast on a small plot, but for best results plants should be spaced about a foot apart when seedlings. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Parsley is a good source of vitamins.

If plants are attacked by aphides, these can be controlled by spraying with nicotine sulphate at ½ fl. oz. plus ½oz. of soap to 2 gallons of water.

[*Sparrow*

When the garden is being dug over it is good practice to apply lime, as most soils benefit from periodic applications and the effectiveness of lime is in relation to the intimacy of its contact with the soil particles.

Peas

Where the soil is well drained and the aspect is favourable peas can be sown now, even in southern districts. Nothing is to be gained, and the crop may be disappointing, however, if seed is sown in cold, wet ground. It is not unusual for crops sown in favourable conditions to mature before crops sown several weeks earlier under unfavourable conditions. Because the length of time over which most varieties of peas can be harvested is very limited, it is advisable to make a number of successional sowings.

Peas do well in cool conditions and prefer a moist, well-drained soil rich in humus. They repay good cultural methods and the ground should be deeply dug and manured, preferably in autumn, with organic material such as stack bottom, compost, or farmyard manure. Dwarf varieties such as William Massey and Little Marvel can be grown without staking, but the rows should be kept earthed up. If, however, short sticks or suitable twiggy materials are available, dwarf varieties should be staked, because plants are usually better if given support.

Most varieties of peas can be harvested only for a comparatively short time and to obtain a succession it is usually advisable to make sowings at intervals of about 3 to 4 weeks of varieties having nearly similar maturity periods or to sow at about the same time several varieties each of which will mature its crop in succession.

Seed should be sown 1½in. to 2in. apart in V-shaped or broad, flat drills, which can be drawn out with a hoe 18in. to 30in. apart according to variety. Drills should be 2in. to 3in. deep except where conditions are hot and dry, when they should be considerably deeper, so that though the seed should not be covered by more

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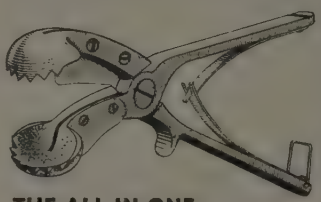

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than 1½in. to 2in. of soil, the roots will be well down in the cooler and moister lower soil levels.

Potatoes

It is too early yet in most districts to make the main-crop planting of potatoes, but seed can be purchased and the tubers set to sprout in a box in a light, airy, frost-free shed or outbuilding. Well-sprouted tubers planted shallowly in well-drained soil in a favourable situation send shoots above ground within 2 to 3 weeks. As frost is likely in many districts until late October and in most southern districts until mid-November, the shoots of tubers planted in August are likely to be destroyed unless continuously earthed up.

Very early planting does not always result in correspondingly early maturity. If tubers planted very early are set deeply, they usually respond slowly because of the colder ground temperatures; if planted shallowly, they must be regularly earthed up to prevent frost damage. Though a severe frosting of the tops rarely kills young plants, it invariably reduces yield.

Earthing up protects the tops from frost, but normal development is impossible unless the plant is enabled to develop green leaves, with which in the presence of light it manufactures sugar, which it builds up into starches and other substances. The advantage of early planting therefore lies mainly in the development of the underground system, which, even if of only moderate size, forms an excellent basis for development when frost danger is past.

The cold soil conditions engendered by frost may also make young potato plants more susceptible to the attack of the fungous disease *Corticium solani* (also known as rhizoctonia canker or black scurf), which frequently causes misses in the potato rows by attacking and destroying the young shoots as they emerge from tubers. The same fungus may also attack the bases of potato stems and cause a dry canker, which in turn may cause the stems to thicken or the upper leaves to roll slightly and in some varieties to take on a purplish tinge. Sometimes tubers form in the junctions of the branches and the tubers in the soil may develop only near the surface of the soil and may be rather misshapen.

Protection of Tubers

If the tuber moth is likely to be troublesome, tubers set to sprout should be dusted with D.D.T., hydrated lime, arsenate of lead, or an insecticide such as that containing rotenone (derris).

Aphides may also be troublesome on the shoots of tubers set to sprout and tubers may have to be sprayed with nicotine sulphate as advised for parsley.

Because of its freedom from disease Government Certified seed is usually preferable, but in districts where disease is not especially troublesome and large Certified seed is difficult to get some home gardeners prefer to use medium or large tubers saved from a disease-free crop for early planting, because experience has shown that other factors being equal, large tubers usually produce much stronger plants earlier than small tubers.

[*Sparrow*

Potatoes of an early variety (in early districts of a main-crop variety) can be set to green and sprout in August. Where the potato tuber moth is likely to be troublesome tubers should be dusted with D.D.T. If aphides appear on the young shoots, they should be sprayed with nicotine sulphate.

If the tubers are to be cut, at least two eyes should be left on each section. As control of conditions for healing is difficult for the home gardener, planting should be done immediately after cutting.

Good, well-tried varieties for early planting are Epicure and Arran Banner, but there are other good varieties well suited to specific locations. Where space permits it is a good plan to try out several different varieties. Early potatoes can be set 10in. to 15in. apart in the bottoms of trenches 4in. to 5in. deep and 24in. apart.

Rhubarb

Though most home gardeners prefer to establish new rhubarb beds with crowns brought in from outside sources or by the division of crowns grown in their own gardens, rhubarb can easily be grown from seed sown in August, September, or October. Seed should be sown 1in. deep in rows 15in. apart in fertile, well-drained soil. Seedlings should be thinned to about 6in. apart as soon as they are properly established. Young plants can be set out in their permanent positions early in the following spring.

Usually few if any stalks should be pulled from rhubarb until after the second year of establishment from seed, though the home gardener should be guided by the condition of his plants. A moderate amount of earlier pulling may not harm the plants if they are large, well established, and vigorous and the soil is moist and fertile.

Generally it is rarely possible to recommend seed of a particular variety of rhubarb, as usually plants raised from seed are extremely variable in their characteristics and in the quality and flavour of their stalks.

In most districts main-crop rhubarb should now be showing signs of growth. The buds on the rootstock or crown first enlarge and then the new growth bursts forth. If a new bed is to be planted or the crowns in an old one are to be broken up, no time should be lost.

Rhubarb is a hardy plant that will stand a great deal of abuse, but for best results the crowns should be planted before growth has developed beyond the stage where the buds can be clearly distinguished but have not burst. It is advisable to await this stage so that the splitting of the crowns, usually best accomplished with a sharp spade, can be done efficiently. Only one or two buds should be left on each section of the crown to be planted.

Replanting

Replanting should usually be done about every 4 years, but variety, soil,

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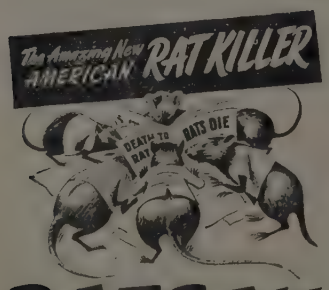

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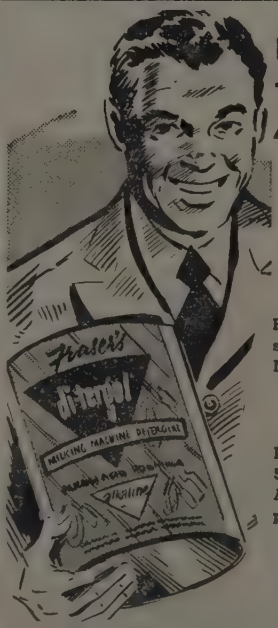

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and situation all play their part and in some instances beds will continue to produce good stalks for up to 10 years. If, however, the stalks become thin, weak, and very numerous, it will usually be found that the crown has become hollow in the centre; it should be dug up as soon as it is dormant, split, and replanted.

When crowns are replanted the tops should be covered with soil to a depth of about 1in. The soil should be rich in organic matter such as stable or farmyard manure, compost, or rotted stack bottom. Where strong crowns have been planted in well-drained soil over-manuring is unlikely under the conditions ruling in most home gardens, as rhubarb is a rank-growing plant and responds especially well to a rich soil. If natural organic manure is not available, a liberal handful of blood and bone mixed into the soil around each crown will usually give good results.

Good drainage is important and the site of a new bed should be trenched or deeply dug and perennial weeds such as couch grass, oxalis, or convolvulus removed. If necessary, the area can be drained by field pipes or by the deep burial of open, stony material to form a moraine drain. Because it is a perennial, rhubarb is frequently planted at the end of a garden where its presence will not interfere with the digging over of the garden plot, and it is often at a boundary fence that couch or convolvulus is most troublesome. Whether rhubarb is to be planted or not, August is a good time to dig along boundary fences and to remove all perennial weeds.

Unless rhubarb planted this spring makes exceptionally good growth, no stalks should be pulled this year; even next season discretion should be exercised, as the pulling of stalks is exhausting to the plant and future development is likely to be seriously affected by too heavy pulling.

There are many good varieties of rhubarb on the market and a selection may be made of early, main-crop, and ever-bearing varieties. For very small gardens an ever-bearing variety is probably preferable, but where space permits and if rhubarb is popular in the home, all three kinds should be planted. As stocks of varieties sold are often variable, it is advisable where possible to choose a variety the quality and vigour of which are known to be good.

Salad Vegetables

Largely because they are eaten raw, salad vegetables are almost without exception a useful source of vitamins. In the well-planned garden an adequate supply should be available for as long a period each year as the weather permits. The list of plants used in salads includes beet, celery, chicory, chives, cress, cucumber, endive, lettuce, mustard, nasturtium, onion, shallot, and tomato.

Lettuce, Radish, and Spring Onions

If ground conditions are favourable, small successional sowings of lettuce, radish, and spring onions may be made. These vegetables remain in the best condition for only a limited time and should be used when young and fresh. A well-drained, deeply cultivated soil rich in humus is necessary, as quick, vigorous growth is essential for crisp, succulent produce. The soil for lettuce in particular should be well supplied with nitrogenous matter; dried blood, blood and bone, or poultry manure is excellent.

Seed of radish, spring onions, and lettuce should be sown thinly ¼in. to ½in. deep in rows 12in. apart. When well through the ground lettuces can be thinned to 8in. apart. Alternatively, lettuce seed may be sown in boxes in a frame and the plants set out when 2in. or 3in. high.

Good varieties for sowing or planting now are:—

Lettuce: Imperial 410, Imperial 615, and Imperial D.

Radish: French Breakfast and Long Scarlet.

Spring onion: White Portugal and Odourless.

Silver Beet and Spinach Beet

There have been some very fine strains of silver beet (also known as Swiss chard and sea kale beet) produced in recent years and the large but tender and succulent midribs of some strains, if properly prepared, are not unlike sea kale in flavour. In New Zealand the plant is grown mainly for its green leaves. Spinach beet is closely allied to silver beet and the leaves are used after the manner of spinach. It can, however, be harvested for very much longer than spinach and once established it is much more tolerant of adverse conditions such as dryness and extreme temperature changes.

Silver beet and spinach beet do well in conditions which suit lettuce. The soil should be well drained and rich in organic manure and cultivation should be deep and thorough. Where conditions are favourable seed can now be sown in rows 15in. apart in the open ground and the young plants later thinned to 8in. apart in the rows. Soil in good physical condition but lacking in plant food can be improved by a complete fertiliser or dressing of blood and bone forked in along the proposed line of row.

Good varieties include: Silver beet, Lucullus and Dark Green Broad Ribbed. Spinach beet, Perpetual Spinach.

Shallots

In the home garden shallots are mainly grown for pickling or flavouring. They are easily grown and prefer a well-drained soil in a sunny situation. Culture and harvesting of shallots are similar to those for onions except that shallots are increased by offsets or cloves and can usually be set out earlier than onions.

May is often favoured for planting, though the common rule for the culture of shallots is to plant on the shortest day and to harvest on the longest. The shallot is a particularly hardy vegetable, and because it is planted as a small bulb, it is better adapted to stand rigorous conditions than plants of closely allied families which are grown from seed. However, planting on the shortest day is of little advantage if soil conditions and weather are unfavourable.

Bulbs should be graded to size and planted 5in. to 8in. apart in rows 12in. apart. Each bulb should be pressed firmly sufficiently far into the soil to keep it in position, though some growers prefer deeper planting and set bulbs to half to three-quarters of their depth. If bulbs are set deeply, the earth should be drawn away from them as they mature. All flower heads should also be removed during growth.

Standing and Stored Crops

In most districts only the latest varieties of savoy cabbage are now standing and by the end of the month reliance will have to be placed on leeks, spring cabbage, or winter cauliflower or broccoli. It is advisable to protect the developing curds of winter cauliflower by breaking a leaf or two over the heads of those that are nearly mature, and if spring cabbage appears to be lacking plant food, liquid manure should be applied.

A weekly application of liquid manure made by soaking a small bag of farmyard manure in a large container of water is usually beneficial. This is a safe manure and is particularly suited to crops such as cabbage, lettuce, and silver beet, which thrive in a rich soil. If organic manure is not available, liquid manure made by dissolving 1oz. of nitrate of soda or sulphate of ammonia in 2 gallons of water may be applied weekly.

At this time of the year the soil in most gardens tends to consolidate and water lying on the top inch or two acts as a seal which restricts aeration and results in lower temperatures and slower growth. Where space permits, therefore, and provided roots of vegetables are not injured, the soil should be loosened by forking lightly or cultivating with a Canterbury type of hoe or tined cultivator.

Most root crops will by now be making second growth and efforts should be made to retard them so that they will not dissipate their substance in the production of seed. Unless crops such as carrots, parsnips, and beet are to be used soon, they should be lifted and reset in a shady part of the garden or stored in damp sand, clean coarse coal ashes, or soil, preferably in a cool cellar or outhouse.

Care of Livestock during August

Contributed by the Animal Research Division

CALVES should be fed their mothers' milk for at least the first 2 days. This is important, as the first milk, known as colostrum or "beastings", contains substances which increase a calf's resistance to scours.

CALF REARING

Since over-feeding is an important cause of this trouble, feed not more than 6 pints daily during the first week, 7 pints during the second week, and 8 pints during the third week. If whole milk is fed, there is no need to give more than 7 pints per day. If scours occur, a supply of a sulpha drug should be obtained from a veterinarian immediately, as the drug is very effective when used promptly. Calves should not be kept in a calf paddock. When 2 to 3 weeks of age they should be rotationally grazed ahead of the cows. This will ensure that they always have access to good, fresh pasture, which they will eat readily. Where good pasture is available, calves can be weaned quite satisfactorily at 8 weeks. Further information about the good rearing of dairy stock is contained in Department of Agriculture Bulletin No. 228.

CARE OF THE CALVING COW

Cows about to calve should be brought into a handy paddock so that they can be kept under supervision. If a cow has difficulty in calving, veterinary assistance should be sought as soon as it is obvious that the presentation is not normal and in any case within 6 hours of the start of labour. Unskilled interference exhausts the cow and makes the veterinarian's task more difficult or even impossible. Veterinary assistance should also be sought if the cow does not clean within 48 hours. Do not hang weights on the afterbirth.

WORMS IN HORSES

Red worms reduce the efficiency of farm horses. Drenching with phenothiazine now will prevent the pastures becoming contaminated with eggs and thus reduce the chances of reinfestation in spring. As phenothiazine causes very severe reactions in some horses, dosing should be done under veterinary supervision wherever possible. If this cannot be arranged, divide the dose recommended on the package into 5 parts and give it over 5 days.

SELECTION OF CALVES FOR REPLACEMENTS

The full sisters of high-producing heifers should always be kept, as should the daughters of Merit Sires with a high progeny test. Provided they are sturdy, the calves of very old cows with good life-time performances should always be kept, and there is no reason why the calves of well-bred heifers should not be kept. The twin of a bull calf should never be kept. Twin heifers may be kept with safety provided they are not too small, especially if they are born early in the season.

MASTITIS

Milk from each quarter should be examined with a strip cup before milking. If it shows any abnormality or if the udder appears inflamed, treatment with penicillin should be started at once. Three tubes of 25,000 units should be injected at 24-hour intervals, even if the milk appears normal after injection of the first tube. Prompt treatment early in lactation will often save a quarter from becoming weak or even blind.

STERILITY IN COWS

If difficulty was experienced in getting cows in calf last summer, now is the time to seek veterinary advice to prevent similar trouble this year. Facilities for diagnosing infectious infertility are available at both the Wallaceville and Ruakura Animal Research Stations. Specimens must be submitted through Veterinarians or Livestock Instructors. Effective control depends on accurate diagnosis.

CARE OF LAMBING EWES

About 10 per cent. of all lambs are either born dead or die during the first week. These losses can be reduced by careful shepherding. Many lambs and some ewes can be saved by skilled assistance during lambing. Always use a reliable lubricating antiseptic on hands and wrists. Faulty presentations must be corrected. A lamb should never be forcibly pulled away when a leg or the head is turned back. A number of lambs die from suffocation through the cleanings remaining over their nostrils. These are very easily removed. Where necessary lambs should be assisted to get a drink. This is particularly important where ewes have very large teats. Drawing away a few squirts from these will reduce their size and enable the new-born lambs to suckle. Ewes with very large teats, very small teats, badly placed teats, or defective udders should be marked for culling. A big percentage of their lambs will die. Many lambs which die during cold or wet weather would survive if they got a good drink soon after birth.

LICE ON CALVES

Calves and yearlings may become very lousy during late winter and early spring. Control can be effected by the use of suitable dips, sprays, or washes of which those containing D.D.T. or B.H.C. are most effective. Repeated treatments may be necessary, as the eggs are difficult to destroy.

DISEASES OF CHICKS

Navel disease is contracted in the incubator, which should be scrupulously cleaned and fumigated with formalin between batches of chicks. Pullorum disease can be controlled only by repeated blood testing of all stock, immediate disposal of all reactors, and thorough cleaning and disinfection of premises after each test.

RICKETS IN POULTRY

Vitamin D, known as the rickets-preventing or sunshine vitamin, is essential to young chicks for normal bone development. Chicks denied daily exposure to sunlight by intensive rearing or prolonged cloudy weather require vitamin D added to the diet, and it is advisable to use fish liver oils containing this vitamin as a routine supplement. The amount added varies according to the potency or strength of the oil; for example up to three-quarters of a pint of an oil containing 100 units of vitamin D per gramme to 100lb. of mash, or half that quantity of an oil containing 200 units of vitamin D.

FEEDING AFTER CALVING

Autumn-saved pasture is the best food for newly calved cows, but it must be grazed in small breaks which the cows will clean up in about 2 hours. The cows should continue to receive as much silage as they will eat and if the pasture is short and sappy, they should also receive hay.

Pasture Management and Spring-sown Cereals

Seasonal Notes by the Extension Division

THE grazing problem in spring and early summer is to keep pasture growth leafy, as grass which is allowed to produce seed heads is much lower in feeding value than leafy grass.

DAIRY FARMS THE dairy farmer who rotates his milking cows round the farm on a daily change basis will find his herd does quite well while there is plenty of leafy growth in the early part of the season, but because of the much more rapid growth in late October and November much of the grass in each paddock gets away to flower, and by December he may be very short of milk producing feed. By January a big portion of his pasture may be covered in dry seed heads, and feed that should be put away as silage and hay is scattered all over the farm. Running the mower continuously over the paddocks in November and December could prevent seeding, but there would be no winter reserves of silage or hay. Good pasture management is achieved by rotational grazing. As spring growth provides more and more feed in each paddock the cows are grazed 2 and even 3 days in each and only a portion of the farm is used for grazing, the rest being closed for silage and hay. When these closed paddocks are cut in November and early December the whole farm is in good order to continue producing leafy, nutritious feed into summer. The mower is also used in early summer for topping as a further means of control and the prevention of seeding.

SHEEP FARMS Both fat lamb farmers and hill country men have the same problem as the dairy farmer, namely keeping the pasture leafy through late spring and early summer, when pasture production is at its maximum and the rate of growth is well above the requirements of the stock that can be wintered. Sheep farmers, however, because of the additional numbers of stock carried at this period due to lambing in early spring and the increasing demand for feed by the lambs as the season progresses, have not generally the same surplus as the dairy farmer to deal with.

The fat lamb farmer in seed producing districts can keep the farm producing leafy feed well into summer by closing paddocks for seed and concentrating the ewes and lambs on fewer paddocks. He can also close paddocks for hay or silage to be used as winter feed for sheep and cattle, such cattle also helping in spring and early summer feed control. Where seed production is not possible a larger area should be closed for hay and silage and more cattle should be wintered. On hill country every endeavour should be made to prevent too much grass getting away to seed. Once grass has seeded it makes little growth until late autumn. The stock should be concentrated on the area they can keep in good order, the closed areas being cleaned up by the cattle in December and early January as the rate of growth falls off on the rest of the farm.

Inspection of any block of typical fat lamb country in December will show the need for greater attention by fat lamb farmers to the condition of their pastures. It is often too obvious that the measures taken, if any, to manage the pastures so that they are kept leafy and producing the highest-quality feed are not very effective, and there is plenty of scope for the greater use of the mower, whether it be for haymaking, grass seed production, or for topping, to stimulate leaf production and prevent formation of seed heads.

—C. J. HAMBLYN

* * *

POACHED PASTURES AFTER a wet winter one or more paddocks on a farm are usually so poached that they need some special treatment to assist in their recovery and prevent the ingress of weeds and inferior grasses. A heavy rolling when the land is moist enough will flatten it out, but oversowing is usually necessary to fill up the bare patches. On good dairying land a mixture of perennial ryegrass, short-rotation ryegrass, and red and white clovers is recommended, the seeding rate varying from 10lb. to 20lb. per acre according to the amount of bare land. A suitable seed-bed can usually be obtained with grass harrows when the land has dried out sufficiently after rolling. The seed and manure should be sown on the harrowed surface and covered with light harrows. As an alternative the seed and manure can be sown on the rolled surface and covered with grass harrows. The area should be treated as a new grass paddock during the first few months by being grazed each time the grasses are about 5in. high. On sheep farms perennial ryegrass and white clover only are recommended, as short-rotation ryegrass and red clover are likely to be eaten out by close grazing. Where a paddock has been poached over several winters the tilth of the soil may have been so spoilt that oversowing may not prove successful, and ploughing, cropping with turnips, and resowing to permanent pasture is recommended.

—G. A. BLAKE

* * *

SPRING-SOWN CEREALS SPRING-SOWN cereal crops have become more popular in Canterbury during the past few years because other cash crops such as linseed and linen flax are not now available for growing on contract.

WHEAT Wheat is sown in spring from August until early September, the earlier sowings being on land prepared over winter and the later sowings on land worked up out of a winter feed crop. The main variety used is Cross 7, which behaves very well under spring-sown conditions, and smaller acreages of Yielder and Fife Tuscan are made on land particularly suitable to these varieties. Quicker-maturing varieties such as Tainui, Marquis, and Jumbuck are seldom used now, as other cereals are preferred for late planting.

BARLEY Barley is generally spring sown, but it has lately become more popular, particularly the recently introduced malting varieties, which not only yield very well but under present conditions are easily harvested and result in a high gross return to the farmer. The improvement in yield and behaviour of these malting varieties has resulted in Kenia being the variety generally chosen for heavy and medium Canterbury soils and Research for lighter Canterbury soils. Smaller acreages of Cape and Black Skinless barley are grown in spring to provide seed for crops to be used as greenfeed. The time of sowing of most barley varieties is from late September to the first week of November.

OATS Oat crops which are spring sown are intended mainly to produce grain for milling or to produce seed of the varieties used for growing cereal greenfeed crops. Milling varieties include the well-known Abundance and Onward (and Russet in South Canterbury), and some new stiff-strawed varieties are at present under trial in an effort to give the grower a direct-heading oat which should make harvesting more efficient with less loss of grain. Feed varieties such as Duns and Winter Greys may be spring sown for a seed crop, and if they are sown early, they may be grazed lightly and then allowed to go to seed. Spring oat sowings take place from August until October.

—J. D. WRAIGHT

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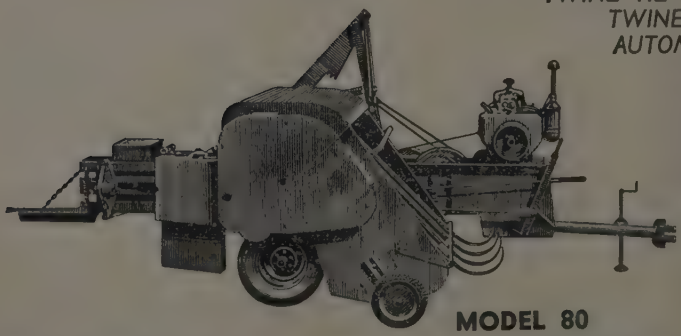

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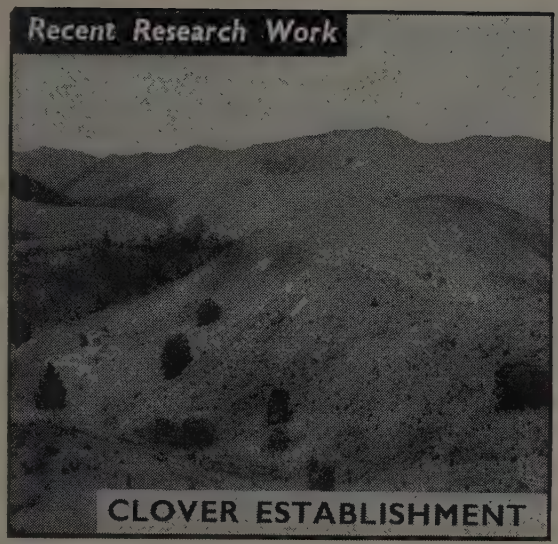

THE life and vigour of a pasture depend very largely on securing a satisfactory clover strike at establishment, and time of sowing should be governed by suitability of conditions for clover to germinate and survive. In the northern parts of New Zealand pasture sowing is usually carried out from early to late autumn, but in the colder and drier southern areas spring or very early autumn sowing is generally most successful.

TRIALS WITH WHITE AND SUBTERRANEAN CLOVERS AT INVERMAY

THESE notes describe work carried out at Invermay Agricultural Research Station and the results are applicable to the coastal districts of Otago. Trials were conducted during the 1950-51, 1951-52, and 1952-53 seasons with New Zealand white clover and Mt. Barker subterranean clover to secure data on the effect of date of sowing on the establishment and survival of young clover plants. In the first season plots were sown monthly from September to March, a mixture of 3lb. of clover and 20lb. of perennial ryegrass being used. In each of the subsequent seasons 200 seeds of each species were sown without grass; in 1951-52 the sowings were made from December to March and in 1952-53 from October to March. In the 1950-51 season the establishment of white clover was satisfactory for every sowing except the March sowing, when frost lift was severe.

Subterranean clover was successful only in the December and January sowings. In the 1951-52 season similar results were obtained. An inspection of the white clover plots in September 1952 showed that the establishment was about 60 per cent. from the December, January, and February sowings, but was only 20 per cent. from the March sowing. Counts taken of the subterranean clover plots at the same time showed that establishment was 20 per cent. for the December sowing, 60 per cent. for January and February sowings, and less than 10 per cent. for the March-sown plots. In the 1952-53 season white clover established well from spring and early summer sowings, but poorly when sown in February and March.

March sowings of white and subterranean clovers have therefore not been successful in the three seasons' trials at Invermay. White clover establishment has generally been satisfactory from sowings between October and February and subterranean clover from late December, January, and February sowings.

—N. A. CULLEN

* * * *

CLOVERS ON NORTH ISLAND SURFACE-SOWN PASTURES

A LARGE number of trials have been carried out to investigate the improvement of North Island surface sown hill country pasture swards by introducing clovers and topdressing. Results from trials with clover seeds pelleted with fertilisers have been disappointing. Clovers have established best when oversown on a short and open pasture or when the surface has been cultivated. For most districts autumn sowing has given the greatest density of clovers, though early spring sowing has often given a better initial strike. All trial work has shown that topdressing aids clover growth, and establishment has always been poor without an accompanying application of phosphatic fertiliser. An initial dressing of 2cwt. to 3cwt. per acre of superphosphate and further dressings every year have given the best results.

SUBTERRANEAN CLOVER

Subterranean clover is especially suited to sowing on the sunny and therefore drier, less fertile hill slopes. A mixture of both Mt. Barker and Tallarook varieties may be sown at the rate of 3lb. per acre, as Tallarook is the more persistent clover and Mt. Barker is good for growth early in the season, but tends to fade out of the pasture after several years. Subterranean clover has established especially well on areas that have been surface cultivated.

WHITE CLOVER

White clover at 2lb. per acre is the best legume to sow, provided the fertility requirements are sufficiently high. Kentish wild white clover, a low-growing variety, has been satisfactory in only a few trials, where under severe grazing it has produced a fair amount of feed. In some trials both white clover and Montgomery red clover have established surprisingly well on uncultivated browntop when they were oversown with ample fertiliser. In dense browntop Montgomery red clover at 2lb. per acre has established better than white clover, but unfortunately has not been as persistent as the other clover species.

LOTUS MAJOR

Lotus major at 1lb. to 2lb. per acre, though slow to establish, is most useful under conditions too hard for white clover, such as newly cleared country and damp and steep areas. In one trial in the Dannevirke district the plants formed a dense mat and assisted in the control of large patches of fern. A new series of trials compares *Lotus major* with Cascade lotus, a broad-leafed variety of *Lotus corniculatus* which is said to establish readily, be capable of high production, and compete well with grasses under a range of climatic conditions.

—SHONA M. MACLEAN

* * * *

RED CLOVER ON PUMICE LAND

NUMEROUS experiments have been carried out to determine the most effective combination of grasses and clovers for permanent pastures on virgin pumice soils. Red clover, particularly cowgrass, grows very strongly on freshly broken pumice land and if the growth is well controlled by grazing, it is an excellent fertility builder. However, if the growth is not well controlled, it will smother out white clover and ryegrass. Montgomery red clover has not given results as good as cowgrass and should not be used to replace cowgrass in permanent pasture mixtures. Trials have shown that cowgrass seeding should be limited to 2lb. to 3lb. per acre; certainly not more than 3lb. should be sown.

—C. R. TAYLOR

HEADING PHOTOGRAPH: Surface sown hill country pastures in inland Wanganui which could be improved greatly in carrying capacity by oversowing with clovers and topdressing with phosphatic fertilisers.

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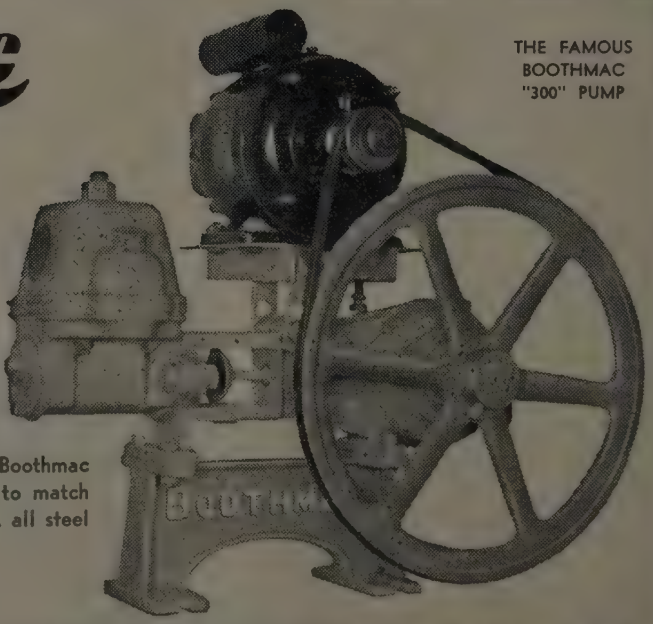

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Dust Gun for Insecticides Operated by Carbon Dioxide

By T. PALMER-JONES, Research Officer, Department of Agriculture
Animal Research Station, Wallaceville

A DUST gun operated by carbon dioxide which has proved efficient for destroying wasp nests in the ground and swarms of bees lodged in buildings is described in this article. Simple methods suitable for the destruction of wasp nests by the public were given in the "Journal of Agriculture" for December 1954. The dust gun now described provides efficient means of destroying wasp nests, but it is too costly for use by the public and was designed for individuals engaged in the wholesale eradication of wasps or unwanted swarms of bees.

IN the usual type of dust gun insecticide is driven from the canister through the nozzle by air forced in and out of the canister by a hand pump.

In such air-operated dust guns the insecticide is not driven out in a sudden explosive burst with great powers of penetration as it is with the type operated by carbon dioxide.

In this gun carbon dioxide is supplied from a standard fire extinguisher with trigger release holding 4lb. of carbon dioxide. The extinguisher is connected by its discharge opening to a small expansion chamber, 2½in. long x 1¼in. diameter, which is attached to a screwtop canister, 5in. long x 3½in. diameter, resembling the type used in hand dust guns. The screw top of the canister is also of the conventional dust gun type. It has a small vertical opening for the entry of the carbon dioxide and a larger horizontal one through which the gas issues laden with insecticide. The canister and other fittings should be of 12-gauge brass, because the carbon dioxide leaves the cylinder under considerable pressure. A piece of metal tubing 8in. long and of ⅜in. diameter is screwed on to the outlet from the canister. It can be inserted into the tunnels leading into wasp nests or into other small openings.

The dust gun. A—Delivery tube. B—Canister for insecticide. C—Expansion chamber. D—Rubber bung. E—Carbon dioxide cylinder. Below—Close-up of rubber bung (D) in place behind trigger as a safety device.

It is advisable to push a rubber bung into the space between the trigger and the handle of the main cylinder for safety when the dust gun is being carried and when it is not in use; as an additional precaution a small hole can be bored in the end of the trigger so that it can be wired back. These measures prevent its accidental discharge.

Protective goggles should be worn when the dust gun is in use so that the eyes are protected from any insecticide which may blow back. Care should be taken to avoid inhaling the dust discharged from the gun. A bee veil should be worn.

Operation

The canister holds approximately 1lb. of D.D.T., which should contain 10 per cent. of para para isomer (p.p.i.), or 1lb. of B.H.C., which should contain 10 per cent. of gamma isomer, both in the form of fine powders. The canister unscrews from the dust gun and is filled through a metal funnel. If the trigger of the dust gun is pressed and instantly released, sufficient carbon dioxide will escape from the fully charged cylinder to expel about half the contents of the canister.

But as the pressure drops less insecticide is expelled at each release of carbon dioxide. Usually the dust gun is used intermittently and no trouble is experienced through excessive cooling or deposition of solid carbon dioxide inside the expansion chamber and canister.

The cylinder used was the fire extinguisher type in which carbon dioxide leaves through a tube passing to the bottom. This arrangement draws off the solid carbon dioxide, which is more efficacious in quelling a fire. Removal of the tube results in carbon dioxide gas alone leaving the cylinder. However, perfectly satisfactory results were obtained without the tube being removed.

The cylinder requires recharging after approximately 30 discharges. A firm with branches throughout New Zealand will do this for a few shillings. If the dust gun is being used frequently, a spare cylinder is a convenience.

Destroying Wasp Nests

In the Ground

For destruction of wasp nests in the ground the canister is charged with approximately 2oz. of D.D.T. containing 10 per cent. of p.p.i., which is sufficient to destroy a wasp nest. The tube from the canister is inserted well down the passage leading from ground level into the cavity surrounding the nest and the insecticide blown out of the canister. This method ensures that the insecticide covers the whole of the outside of the nest as well as the inside of the cavity. Here it cannot be affected by rain or falls of earth and the wasps must come in contact with it. Within a few days the nest will be completely destroyed, but a week should be allowed so that wasp larvae can hatch out and come in contact with the D.D.T.

DUST GUN . . .

In Basements or under Roofs

Inaccessible wasp nests in the basements of houses are readily destroyed with the dust gun. The gun is loaded with 2oz. of D.D.T. and the nozzle is inserted before discharge through the ventilator or other opening from which the wasps are issuing. A further 2oz. of D.D.T. should also be discharged through a ventilator or opening near the one from which wasps are issuing. Frequently nests are situated some distance from the point of exit of wasps, and discharge of the dust gun from two points ensures a wider coverage by the D.D.T. If there is only one opening, 4oz. of D.D.T. should be discharged through it.

When wasp nests are under roofs the nozzle of the gun, which should be loaded with 4oz. of D.D.T., should be inserted in the cavity as close as possible to the nest either from outside the roof or through a small hole bored in the ceiling of the room below.

Bee Swarms in Buildings

The dust gun has proved most efficacious for destroying swarms of bees lodged in buildings. Swarms under roofs and weatherboarding are easily dealt with in a few minutes. It is necessary only to find or make an opening near the swarm, insert the nozzle into the free space surrounding the swarm, and press the trigger. Frequently 2oz. of D.D.T. containing 10 per cent. of p.p.i. will destroy a swarm, but if the swarm is large, it is advisable to use a greater charge, say 4oz.

B.H.C. or other insecticidal dusts may be used in place of D.D.T. in the dust gun. However, D.D.T. of 10 per cent. p.p.i. content is cheaper and less dangerous to the user than most insecticides and has been found entirely satisfactory for bee and wasp destruction.

For Other Insects

The gun may be used to destroy other insects. Thus insecticidal dusts may be blown in penetrating clouds into inaccessible spaces harbouring ants and cockroaches. Rooms used for purposes which attract flies may be dusted with the gun.

The dust gun should always be used so that while the nozzle is inside the space containing the wasp nest or swarm the operator is outside in the open. On no account should the operator discharge the gun in any confined space he is in. Before the gun is discharged care should be taken to ensure that the open end of the nozzle is not blocked by honeycomb or debris.

It must be realised that instructions cannot be issued to cover every eventuality and occasionally wasp nests and swarms will be found in unusual situations which will call for the display of some initiative in their destruction.

The dust gun is the most effective instrument for destroying swarms of bees lodged in buildings, and in wasp control it gives results comparable to those obtained by other methods. However, though it is very cheap to operate, its high initial cost, approximately £14, rules out its use by the general public. It is not recommended for the destruction of bees in hives infected with American foulbrood preparatory to the infected hive material being burnt.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during August as follows:—

1XH Hamilton

8 August (12.33 p.m.)—"Disease Control in Poultry", by W. L. Jourdain, Poultry Instructor, Department of Agriculture, Hamilton.

15 August (12.33 p.m.)—"Spring Pasture Problems", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

22 August (12.33 p.m.)—"Wool Marketing", by M. G. Hewitt, Federated Farmers, Hamilton.

26 August (8.10 p.m.)—"Current Farming Problems", by a panel of speakers.

29 August (12.33 p.m.)—"The Incidence of Feed Flavours in 1954-55 Season", by G. Purvis, Superintendent of Butter Instruction, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

4 August—"Young Farmers' Club Talk", organised by the Matamata district committee of the Federation of Young Farmers' Clubs.

18 August—"Review of the Incidence of Feed Flavours in 1954-55 Season", by G. Purvis, Superintendent of Butter Instruction, Department of Agriculture, Hamilton.

2XA Wanganui, 8 p.m.

4 August—"For the Country Woman", by Mary MacDonald.

11 August—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

18 August—"Control of Poultry Diseases", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

25 August—"Molybdenum Topdressing", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

3YA Christchurch

1 August (12.20 p.m.)—"The History of the Christchurch Y.F.C. District Committee", by D. Worsfold, Darfield Young Farmers' Club.

22 August (12.20 p.m.)—"Care and Feeding of Farm Dogs", by J. A. Miller, Livestock Instructor, Department of Agriculture, Blenheim.

25 August (7.15 p.m.)—"Foot-rot Control", by A. G. Brash, Veterinarian, Department of Agriculture, Christchurch, L. Wightman, Livestock Instructor, Department of Agriculture, Amberley, and Mr. J. Fulton (farmer).

4YA Dunedin, 9.15 p.m.

1 August—"Frost and the Fruit Grower", by W. S. Kemp, Horticultural Instructor, Department of Agriculture, Alexandra, and an orchardist.

8 August—"Fertilisers Special Mixtures", by H. A. Duff, Fields Instructor, Department of Agriculture, Dunedin.

15 August—"Look to Those Chicks", by J. Jones, Poultry Instructor, Department of Agriculture, Oamaru.

22 August—"Wool Improvement", by W. J. Hansen, Sheep and Wool Instructor, Department of Agriculture, Dunedin, and Dr. L. F. Story, New Zealand Woollen Mills Research Institute.

29 August—"Farmers' Irrigation Schemes", by W. A. Lunn, Fields Instructor, Department of Agriculture, Dunedin, and a farmer.

4YZ Invercargill, 7 p.m.

2 August—"Agricultural Experiments in Eastern Southland", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore. "Breeding Problems", by J. P. Anderson, Veterinarian, Department of Agriculture, Invercargill.

9 August—"Agricultural Experiments in Eastern Southland", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Wool Textile Research Conference in Australia

An international conference on wool textile research will be held in Australia during August and September. A number of scientists of international reputation in wool research and related fields have been invited to give addresses. The conference secretary is Mr. C. Garrow, Wool Textile Research Laboratory, C.S.I.R.O., 343 Royal Parade, Parkville, N2, Victoria.

Deficiency Problems in the Home Garden

By K. J. McNAUGHT, Agricultural Chemist, Department of Agriculture Soil Research Station, Rukuhia

THE home gardener has available many sources of information on different aspects of plant culture such as articles in the "Journal of Agriculture", bulletins, lectures to gardening circles and branches of the Royal New Zealand Institute of Horticulture, horticultural exhibits at shows, pruning demonstrations, and other mediums, and through radio talks by scientific officers or gardening experts. These, as well as books and articles in gardening journals, provide the gardener with valuable information of a general nature on the most suitable plants to grow in his district, choice of position, general cultural and manurial treatments, and methods of disease or pest control. If the advice is faithfully followed, there is every prospect of success.

UNFORTUNATELY in practice it is not easy to alter the fundamental properties of soils and not all homes are endowed with "rich deep loams" or soils of good tilth, nor can "well-rotted manures" be obtained just for the asking. The problems arise when it is not feasible or practicable to follow the advice given, or when the gardener has poor results or failures in his plants.

Causes of Troubles

Stunting of growth, unhealthy foliage colour, die-back, and other troubles may be due to any one cause or combinations of many causes, including disease, climatic, management, environmental, and nutritional factors. Of these, soil or nutritional factors are only a fraction of the possible causes which must be considered. Many failures are due to:—

1. Fungous, bacterial, or virus diseases.
2. Insect attack.
3. Unfavourable temperature, light, or moisture conditions.
4. Cultivation, fertiliser, or spray injury.
5. Poor soil structure or drainage.
6. Poor-quality seeds or seedlings.
7. Mineral deficiencies or toxicities.

Most vegetables do poorly in a shaded garden or under trees or shrubs or near hedges, even when planted in early summer and well fertilised. Unseasonable weather, for example cold wet conditions after planting, often results in poor strike of seeds. In most districts the gardener is wasting his time attempting to grow out-of-season plants in the open. Only in specially favoured localities will late or very early crops be a success. Light, heat, and drainage are usually dominant factors in such cases. Maincrop potatoes are usually not as successful in the dry volcanic soils of the Auckland Province as in heavier soils or South Island soils, as they require a cool, moist root run for best results. It is best to accept the limitations of the environment and select plants suited to the locality.

A frequent cause of trouble is the drying out of roots of seedling plants or shrubs before planting or failure to water the soil adequately when planting into dry soil. Trouble can also arise from use of excessive amounts of fertilisers or from fertilisers or raw organic materials making contact with plant roots or seeds.

Poor drainage, resulting in "wet feet", is a very important factor, especially in perennials, shrubs, and fruit trees. A waterlogged condition, even of only a few hours' duration, can have serious effects on the health of plant roots. Furthermore, a soil subject to periodic waterlogging is usually relatively infertile and may remain so until well drained. A common mistake when trees or shrubs are being planted in clay soils is failure to provide drainage. When water does not penetrate readily drainage must be provided to the depth of the hole dug for planting; otherwise the plant may be sitting in a pool of water after heavy rain.

Unrecognisable Factors

Many of the factors responsible for poor crops or unsatisfactory growth can be assessed by the home gardener. For example, he can examine his cabbage plants or swedes for club root,

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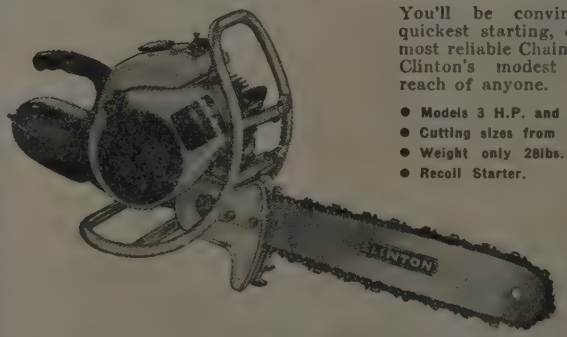

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carrots for aphis or carrot fly, gladioli for thrips, and gooseberries for red spider. He can easily recognise potato or tomato blight, silver leaf, brown rot in stone fruits, canker in Lawson's cypress, mosaic virus in tomatoes, or cutworm or slug injury. He can note frost or drought injury, but he cannot merely by looking at or handling the soil tell whether it is in need of lime or whether he has used too much or too little fertiliser. He cannot fail to observe whether his soil falls apart into a powder when dry or holds a good crumb structure or whether it is very sticky when wet or remains porous and free draining. He can examine the subsoil in wet weather to see whether drainage is impeded at depth. He can tell roughly by the feel whether the soil is a silt or clay loam or whether it contains coarser particles such as sand, but he cannot tell from appearance or feel whether the soil is deficient in plant foods.

Aids in Assessing Deficiencies

There are several possible aids to enable the home gardener to find out whether his soil is in need of lime or fertilisers.

Experiments

A limited amount of experimenting can be carried out in the home garden with vegetables, but it can only indicate major deficiencies. If two rows of potatoes are planted, it is feasible to use different treatments for each row, but it is preferable to have several rows of any one treatment. For such comparisons it is essential that the soil be uniform, and for the comparison to be of any value it is desirable that the treatments be identical with the exception of one component; for example, one row should have potash and one should have none. If the gardener tried to compare a mixture of fowl manure and sulphate of potash with a mixture of blood and bone and wood ashes, he could not interpret the result satisfactorily. It is not a true test of a trace element such as molybdenum if molybdenised superphosphate is compared with no fertiliser. The comparison should be against the same quantity of normal superphosphate. If there is a response to the fertiliser, it may be due to the molybdenum or to the superphosphate or to both. Equally good results might have been obtained (and in most cases certainly would be obtained) from the use of superphosphate alone. Variable soils resulting from different treatments in the past make experimental work in the home garden hazardous, and misleading indications may be obtained especially from single row or half row experiments.

Liming and Fertiliser History

It pays to work out exactly what rates of lime have been used. It is easy enough to pace out the number of yards and work out the area of the beds treated. If the gardener has kept any records or can recall the amount of lime used, he can easily work out how much has been used per square yard (8oz. per square yard equals approximately 1 ton per acre). If more than 1lb. to 2lb. of ground limestone per square yard has been used, it is possible that the soil has been over-limed, especially if it is light or sandy. Heavy clay soils and undecomposed peats may require this quantity of lime for best results with many vegetables.

Fertiliser rates, too, should be checked and compared against recommended amounts. Even quite a heavy dressing of fertiliser such as muriate or sulphate of potash may appear when distributed to be quite insignificant, and the tendency to give another application for good measure must be resisted. Plants can easily be killed through excess fertiliser. Even quite light dressings of soluble fertilisers such as potash can seriously affect germination of seeds and cause burning of roots of seedlings and it is wise to keep such fertilisers from direct contact with seeds or roots of seedlings. Ideally they should be placed in a band below the seed or applied about a week before planting and well mixed with moist soil to reduce contact injury.

Likely Deficiencies as Indicated by Soil History

The likelihood of some deficiencies can be predicted from the history and a knowledge of the inherent properties of certain soils. Thus some soils are prone to boron deficiency and others to potash deficiency, and troubles due to these deficiencies can be expected if fertilisers containing the appropriate nutrients have not been used. The deficiencies most likely in the home garden are those of nitrogen, phosphorus, potassium, calcium, magnesium, manganese, molybdenum, and boron. Sulphur, iron, and zinc deficiencies are unlikely in vegetables, but iron and zinc deficiencies may sometimes occur in fruit trees and copper deficiency in citrus, and iron deficiency is possible in some shrubs and in ornamentals such as carnations, which are often overlimed.

Vegetables on peat soils may respond to copper. The commonest major element deficiencies in the home garden are still those of nitrogen, phosphorus, and potassium, and the most frequent trace element deficiency is that of boron. Magnesium deficiency can occur especially on unlimed soils which have received heavy dressings of potash and sulphate of ammonia. Manganese deficiency has been noted in vegetables, especially on some overlimed sandy soils and in fruit trees on soils of high pH. Liming a soil which is too acid usually corrects

Experimental plots at Rukuhia. The plot at the left shows severe stunting of growth of various plants due to phosphorus deficiency, but no abnormal colour symptoms.

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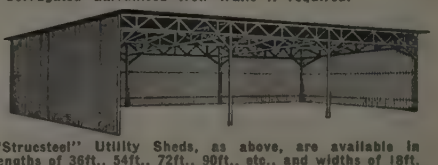

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Potash deficiency in brassicas produces characteristic marginal bleaching and leaf burn.

molybdenum deficiency and manganese excess, as well as supplying calcium. Apart from boron and molybdenum deficiencies, trace element deficiencies appear to be uncommon in the home garden.

Soil Type

In the Soil Bureau classification of New Zealand soils a soil type is described by a place name and an indication of the soil texture. Thus near Hamilton several soil types are distinguished: Hamilton clay loam, Te Kowhai silt loam, Ohaupo silt loam, Horotiu sandy loam, and Kaipaki peaty loam, as well as the raw peats (Rukuhia peat). It is important to know the soil type, because all classification of the properties of soils, including general occurrence of deficiencies or toxicities, is normally related to the specific soil type and not just to soil texture. It is not sufficient to know that a soil is a heavy soil or a light soil, a volcanic soil or an alluvial soil, or even that it is a clay loam or a sandy loam, and if possible, the exact soil type should be ascertained. For instance, the Ohaupo silt loam has very different properties from the Te Kowhai silt loam. If he knows the exact soil type, the instructor can apply Research Station or Soil Bureau findings from general surveys of trace element and major element deficiencies in pastures or farm crops, orchards or market gardens, and pass on the indications to the home gardener, where this evidence is applicable.

Soil Analysis

Until January 1953 the soil analytical service of the Extension Division of the Department of Agriculture was free. The sending of soil samples by home gardeners was not encouraged, as advisory officers and laboratory staff were fully occupied with requests for soil analyses from farmers, market gardeners, and nurserymen. As policy it was clearly reasonable with a free service to give priority to requests from farmers and market gardeners where the work expended was likely to have the widest application and the greatest value in stepping up production. However, the introduction of a paid service has entitled anyone to request the service through the nearest office of the Department. A charge of £1 per sample is made to cover part of the cost of a visit from the Horticultural Instructor and analyses for pH, available calcium, potassium, and phosphorus and lime requirements. (For a further fee of 15s. available molybdenum can be determined by an accurate but time consuming method.)

The coverage is limited, and the gardener will want to know why, especially as some outside organisations undertake to analyse soils or plants for nearly all the essential plant nutrients.

It is not generally realised how difficult it is to establish a reliable chemical method for the determination of available plant nutrients in soils, and from that the fertiliser and lime requirements of individual soils for particular crops or plants. Anyone can do a quick test as set out in some of the simple testing kits offered for sale to gardeners or can follow quick-test or spot-test procedures described in some overseas publications, but the snag is that many of the indications resulting from these tests are quite unreliable and often completely contradicted by local experimental evidence.

Some of the best-known quick-test procedures described, such as Morgan's methods developed in Connecticut in the United States, are admitted by the authors as applicable only to the few soil types of this state and are not necessarily of value elsewhere. New Zealand has a very wide range of soil types of the most diverse properties, and though most tests so far tried may have given good indications on some soils, they have been unsatisfactory on others. It is not claimed that the methods used at Rukuhia Soil

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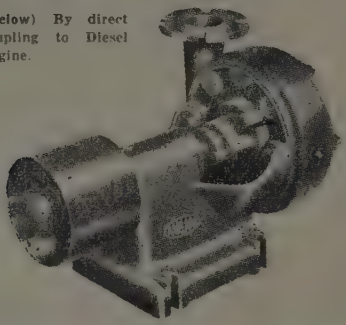

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Research Station or by the Soil Bureau are perfect, but they have been thoroughly tested against results of field trials with pastures, and where anomalies occur with certain soil types these are fairly well known and consequently allowance can be made in the interpretation of the results. Results with pastures cannot be applied directly to market garden or home garden soils, but a lot of work has been done comparing nutrient needs of pasture plants and farm crops with requirements of vegetable and other plants with the object of utilising this fund of basic information on soils under pasture. Most of the recommendations made in New Zealand by outside organisations, usually on the basis of quick-test methods, are very insecurely based.

Plant Analyses

An article on the use of plant analyses as an aid in advisory work was in the "Journal of Agriculture" for June 1954, page 599.

Deficiency Symptoms

When an essential plant nutrient is in short supply growth of the plant or some phase of development such as fruit or seed production or root development may be seriously restricted. An abnormal foliage colour or other visual symptom may give warning of the deficiency, but symptoms are not always present.

Nitrogen: Sweet corn shows an overall yellowing, especially of the older foliage, and premature death or "burning" of the lower leaves. In oats, which are often grown as a green manure, the yellowing and death of the affected leaves are usually accompanied by a reddish-purple coloration of the margins and tips, especially of the older leaves. Plants which show this red tint include swedes, turnips, cabbages, and rhubarb, and those which show no red include potatoes, silver beet, and most varieties of lettuce. Severe nitrogen deficiency always results in either stunted or spindly growth, pale colour, and greatly reduced yields.

Phosphorus: In plants which develop red coloration with nitrogen deficiency the symptoms of phosphorus deficiency may be somewhat similar, but whereas in nitrogen deficiency the reddish pigment is associated with yellowish foliage, in phosphorus deficiency the foliage remains dark green, the deficiency symptom being more violet. The symptom is not specific, as it merely indicates excess of sugar formation over utilisation, which can occur in frosty weather with cold nights unfavourable to growth followed by sunny days, which favour carbohydrate synthesis. The only really characteristic symptoms of phosphorus deficiency are stunting and delay in maturing.

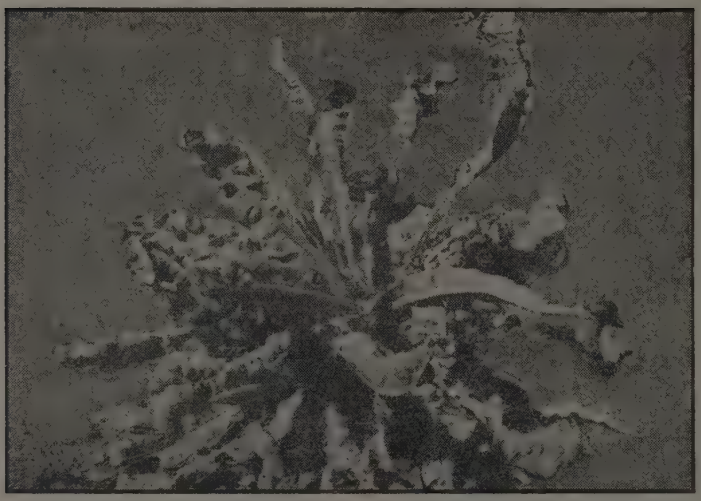
Potassium: In vegetables marginal paling of the foliage followed by death of the affected tissues is typical, for example, in turnips, swedes, cabbages, and cauliflowers. Severe crinkling with browning or blackening of the

foliage is typical in silver beet, carrots, and potatoes. In the last-named early collapse of the haulms and very poor yields of tubers are conspicuous. Potassium deficient plants are less resistant to drought and to disease attack. Tubers of deficient potato plants tend to blacken on cooking, but this symptom may not be specific.

Magnesium: Magnesium deficiency is characterised by yellowing of the tissues between the veins, followed by death of the affected areas, for example, in potatoes and silver beet. In apples premature defoliation of the trees is typical. In glasshouse tomatoes the yellowing usually appears in the lower leaves at the period of major fruit swelling. It can be induced or aggravated by excessive applications of potash. Heavy dressings of magnesium fertilisers are usually needed to cure deficiencies of the element.

Boron: Brown heart or mottled heart of swedes and internal breakdown or crown rot in beets are symptoms of boron deficiency. Cracked stem in celery, hollow stem of cabbages and cauliflowers, and surface and internal browning of the curds of cauliflowers are also characteristic. For treatment of this trouble 1oz. of borax dissolved in 1 or 2 gallons of water should provide enough boron for about 10 sq. yds. In fruit trees boron deficiency results in corky pit or browning near the core. Die-back of the leader growth may occur.

Brown heart or mottled heart of swedes (left) is a symptom of boron deficiency. The swede at right is healthy.



[*Robertson*

Whiptail in cauliflowers. Note the distorted, strap-like leaves.

Molybdenum: Whiptail of cauliflowers is usually due to molybdenum deficiency. Leaves are often narrow and elongated with very little blade showing. In seedling crucifers, for example, turnips and cauliflowers, the deficiency may show as a yellowing between the veins accompanied by inturned leaf margins. Many cases can be cured by heavy liming.

Manganese: Symptoms typically show as a yellowing between the veins of the leaves, for example, in peaches. This deficiency is sometimes difficult to distinguish from mild magnesium deficiency. In tomatoes the pale areas are smaller than in magnesium deficiency. If the trouble in a home garden is due to overliming or to a naturally high soil pH, it is best remedied by acidifying the soil with sulphur at about 4oz. per square yard or with sulphate of ammonia if the soil requires nitrogen Fresh organic matter, which will decompose readily in the soil, may assist.

Copper: On mineral soils deficiencies have been noted in New Zealand only in citrus. In lemon trees the young new growth is yellow instead of the normal healthy bronze red. In grapefruit abnormally large leaves and gum spots on the fruit may be noted. Die-back is sometimes found. On peat soils symptoms have been observed in onions and in sweet corn. In the former the foliage has been described as pale with some die-back from the tips, a symptom usually due to disease. In copper deficient sweet corn or maize yellow striping of the leaves has been conspicuous, but other deficiencies can cause similar symptoms. Other plants have shown no distinct leaf symptoms. Copper deficiency has a marked effect on seed production and on frost resistance.

Iron: In most fruit trees iron deficiency shows as a bleaching of the topmost leaves of the leader growth. In the home garden it is usually best remedied by acidifying the soil as for treatment of manganese deficiency.

Zinc: Deficiency shows in fruit trees as "little leaf" and "rosetting".

Toxicity Symptoms

Marginal and tip leaf burn may be caused by chloride injury, for example, from the use of muriate of potash with sensitive plants, or salt burn from salt spray or salts in the soil. Manganese excess may cause yellowing between the veins or along the leaf margins, symptoms sometimes resembling those of magnesium or manganese deficiency.

Many of the symptoms described are not specific to one deficiency or toxicity and often can only provide an indication of likely causes or reduce the number of possible causes. Other factors sometimes produce symptoms very like those caused by nutritional disturbances. Die-back, for example, can be caused by disease organisms, by frost, by borer, or by root injury resulting from unsatisfactory drainage or attack by root parasites.

Treatment of Deficient Soils

For most soils the normal fertilisers available to the home gardener should give satisfactory results. It is sometimes stated that lime should not be applied to the soil immediately before planting. This is true if burnt lime or slaked lime is used, but in general if a soil needs lime, ground agricultural limestone is the cheapest and safest to use and can be applied any time. If the soil is excessively acid, some time may be required for the limestone to react with the soil, and to allow for this, application should be made in advance of planting. On soils low in magnesium, dolomite (calcium and magnesium carbonate) or talc-magnesite (magnesium carbonate and silicate) are useful materials for reducing acidity and at the same time supplying the major nutrient magnesium which is required by plants in relatively large amounts. On deficient soils serpentine superphosphate is preferable to normal superphosphate, as it adds small but cumulatively significant amounts of magnesium in the form of magnesium silicate or phosphate.

Most difficulty is likely to be experienced with light soils lacking organic matter. In cultivated soils the soil organic matter is the main natural source of nitrogen for non-leguminous plants, and if this is very low, nitrogen deficiency tends to be a continual problem. Animal manures and good-quality composts are valuable for these soils and green manuring sometimes assists in adding or conserving nitrogen.

Drought is also likely to be a problem in such soils and organic supplements will usually assist in moisture retention. Sawdust has been used extensively for this purpose and to add organic matter to the soil. Woody tissues are very low in nitrogen, and as the cellulose-decomposing bacteria require nitrogen for their nutrition, this is taken from the soil, thus creating a nitrogen deficiency which persists until the sawdust is nearly all converted to humus. Sawdust, therefore, should not be worked into the soil unless well decomposed, but it can safely be used as a mulch round many plants, especially if a nitrogenous fertiliser is added to assist decomposition. Straw breaks down in a similar way and all fibrous plant materials tend to rob the soil of nitrogen during decomposition. Even green manures, if worked in at a relatively mature stage of growth, will act in the same way. Only really succulent young growth releases available nitrogen speedily.

Fibrous peat has recently received attention more for its moisture conservation. Whereas animal manures and most fresh plant materials rapidly break down in the soil, peat does not. It is therefore not a good source of plant foods and its main value when applied to light soils appears to be to increase water-holding ability. Its resistance to decomposition is an advantage, as the water-holding properties are associated with the spongy, fibrous nature of moss peats, and these properties would be short lived if the decomposition of the peat were too rapid. Fibrous peat should be excellent for light, structureless soils which dry out badly, and may be preferable to sawdust mulches.

By DAPHNE EILERS, Field Officer in Rural Sociology, Department of Agriculture, Auckland

THE modern home maker is fortunate in having a wide range of detergent materials to aid her in maintaining high standards of domestic cleanliness. If she is wise, she will make full use of the best that is offering, trying out as many kinds as she is able and selecting from them the ones she finds most suited to her purposes.

TODAY the term detergent has become more loosely applied to the soapless cleaners in both liquid and powder form which have appeared on the market. A dictionary definition, however, states that a detergent is "a solid or a liquid which has the property of cleansing". Thus any comprehensive discussion on detergents must include all types of cleansing substances: Soaps, shampoos, soap powders, and soapless detergents.

Soap is a detergent made from a combination of fats or oils with chemical alkalis soluble in water.

Soapless detergents are liquids and powders prepared from a variety of raw materials, but they contain no soap. They must never be used in conjunction with soap unless there is a statement to the contrary on the label or packet.

There are three grades of domestic or household soaps on the market in New Zealand and their content is governed by the Food and Drug Regulations. None of the words "pure", "purest", "genuine", etc., may be used in the labelling of domestic or household soap unless it is first grade. To be classified as first grade a household soap cannot contain more than 1/5 per cent. of free caustic alkali and more than 2 per cent. of alkaline salts and must not contain any filler. A second grade soap can have a slightly higher percentage of alkaline salts and up to ½ per cent. of free caustic alkali. In a third grade soap up to 9 per cent. of alkaline salts and not more than ½ per cent. of free caustic alkali are allowed. Those which are not first grade must be labelled or marked in some way to indicate their grade. Most soaps in the shops are first grade; there are only a few lines of second grade and little or no third grade.

The housewife wishing to test for the presence of free caustic alkali in her home-made soap may do so by placing on dampened soap a drop of phenolphthalein. This is a colourless liquid which will turn pink in the presence of free alkali.

There is no regulation yet governing the standard of soapless detergents.

Action of Detergents

When water comes in contact with an oily or greasy surface it tends to break into droplets. The reason for this is that the surface of the water seems to act like an extremely thin elastic covering. This is known as surface tension. Detergents, whether soapy or soapless, have the power of breaking down this surface tension. In effect they make the water wetter and so enable it to penetrate better into the fibres of the fabric or under the dirt on the skin.

A good lather is necessary not because the lather itself cleans but because it is an indication that sufficient detergent has been used. The lather should remain during washing. If it disappears, too little detergent has been used and some of the dirt will be redeposited in the fabric. A non-lathering soapless detergent, of course, gives no such indication, but strict adherence to instructions on the bottle or packet will give a good cleansing solution. Agitation during washing, such as rubbing of hands together or the tossing or tumbling motion of a washing machine, helps the water to penetrate the fibres of the material and dislodge the dirt. Effective rinsing is necessary to remove all traces of suds and grime or the dirt will go back into the fibre. Where soap is used and clothes are left standing too long in the soapy water the dirt will resettle and it is most difficult to remove

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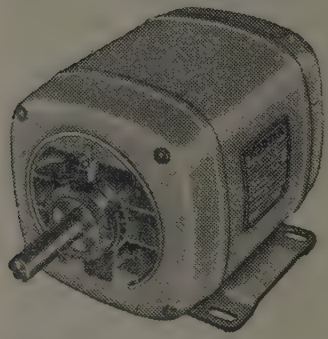

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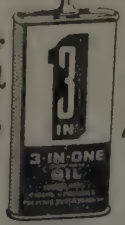

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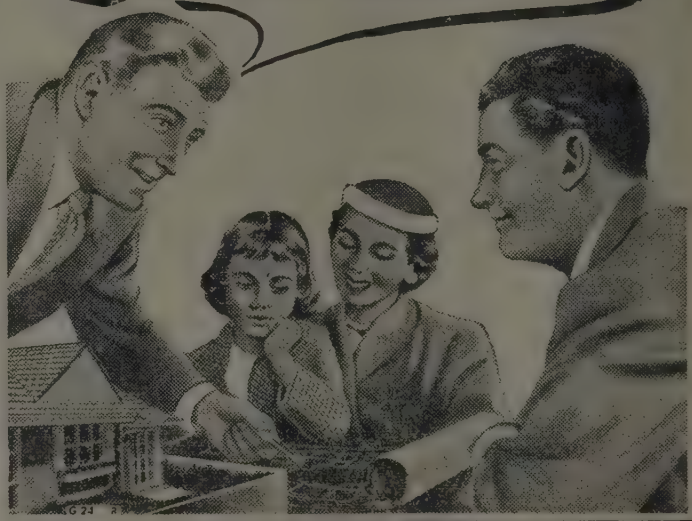

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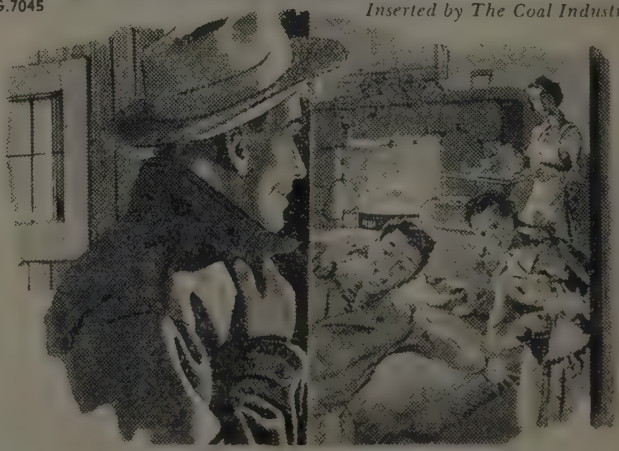


To a warm farmhouse!

To return to an open fireplace where the coal is crackling merrily . . . to let its cheery warmth ease the tiredness of a wintry day in a far paddock . . . this you can enjoy only with a coal fire. Gives such natural, healthy warmth, too. Coal is the most economical fuel. Make sure you have a full coal bin. Order now!

VITAL TO THE NATIONAL ECONOMY

COAL

for a cheerful fire

Have you seen the latest fire grates? Modern in design, they use coal most sparingly, make it even more economical than ever!

Glass 1—Lather formed with soapless detergent in hard water. Glass 2—Scum formed with soap in hard water. Glass 3—Lather formed with soapless detergents in soft water. Glass 4—Lather formed with soap in soft water.

it. There seems to be less likelihood of dirt resettling when a soapless detergent is used.

Quantity to Use

The amount of detergent necessary will depend to a large extent on the type of water in which it is to be used. Some water is hard, owing to the presence of certain dissolved mineral salts, which react with soap to form an insoluble deposit which is sticky and clings to the fibres of the material, causing greyness, harshness in fabrics, and felting of woollens. Such water needs a greater amount of soap or soap powder to overcome the hardness before a lasting lather can be formed. This hardness may be reduced in some waters by boiling or by the addition of a water softener, such as washing soda. This will not remove the hardness completely, but it will certainly lessen the amount of soap needed to form suds. As soapless detergents

Guide to Detergents

DETERGENTS

SOAP

Soap flakes	Suitable for washing by hand: Nylon hosiery, lingerie of all kinds, baby clothes in soft water. Dissolve readily in lukewarm water.
Soap powders	Suitable for washing of heavy, dirty clothes in soft or conditioned water. Not recommended for silk or wool, the colour of which may be affected. Dissolve less readily than flakes, so are better suited to use in washer (machine or boiler) than in basin or tub.
Household bar soaps	Not greatly used today for laundering. Excellent for cleaning wooden surfaces of all kinds, tiles, and paintwork if these are thoroughly rinsed.
Abrasives	Sand and pumice soaps are excellent for scouring, but hard on hands. Abrasives in cream form are finer and useful for metal pots and pans, but more expensive.
Toilet soaps	Reliable wrapped brands are as effective as more expensive, highly perfumed ones.
Shampoos	These are suitable only if used in really soft water.

SOAPLESS DETERGENTS

Powder and liquid (household)	Excellent for dishwashing in hard or soft water; for delicate fabrics; for washing heavily soiled clothing such as overalls; particularly good for woollens; for washing paintwork and general cleaning. Invaluable for use in hard water. Non-lathering types more suitable for washing machine.
Shampoos	Very good for use in hard water. May be drying to scalp if excess is used.

have no chemical reaction with hard water, they will form an immediate lather in hard water and no extra detergent is needed to counter hardness and no water softener is necessary. Soapless detergents act in the same manner in either hot or cold water, whereas soaps have a better cleansing action in hot or warm water.

For the sake of economy it is wise to test different cleansing products for their efficiency and for relative amounts used. These will vary according to the brand and to the type of water. If the housewife forms the habit of measuring the amount necessary to produce a cleansing solution for any given task and records it and the name of the product, she will then be able to find the one that suits her needs best. She will know, too, that she is not using more than necessary and will keep her bills for detergent down to a minimum. Much soap is wasted by thoughtless usage; once a lasting lather is formed the addition of more soap will not be an aid to cleaning.

Uses in the Home

Cleansing agents are used in the home for three general purposes:—

1. For the skin or hair (toilet soaps, shaving soaps, and shampoos).
2. For laundering of delicate fabrics.
3. For household purposes such as general laundering, dish washing, and all phases of house cleaning.

Toilet Soaps

Any soap to be used on the skin or hair should be of the best quality. It should cleanse efficiently and should not have any harmful effect on the skin through having excess of caustic alkali. In New Zealand the maximum amount of free alkali allowable in toilet soap is 1/10 per cent.

Many toilet soaps are "milled". Hot liquid soap is run over water-cooled rollers. The solidified soap is scraped off and dried, perfume is added, and the soap is then run through heavy rollers to compress it to a uniform thickness. The mixture is then cut and stamped into cakes. Because they are firm and hard, milled toilet soaps last a long time, for they do not soften readily in water.

Some of the more expensive soaps on the market have no better cleansing properties than those of the reliable cheaper brands. The difference in price is brought about by the use of more expensive perfumes and by the more ornate, "sales appeal" wrappers.

Shaving soaps and creams are made from highest-quality ingredients and many have extra oils added to them for softening and soothing.

Hair Shampoos

Soap shampoos are mixtures of soap and water in various combinations. Many have an oil base, which is usually olive, coconut, or palm oil and sometimes a mixture of all three. They clean the hair efficiently, keep it soft and pliable, and have no drying effect on the scalp. On the other hand, when used in hard water they form a scum and this leaves a dull film on the hair if it is not thoroughly rinsed.

Soapless shampoos will clean as thoroughly in hard water as in soft. Some are such efficient grease removers, however, that dryness may occur, as some of the natural oils of the skin may be removed by them. Most soapless shampoos have a reconditioning agent (usually a neutral oil) to counteract this drying effect, which may result in irritation of the scalp. For this reason ordinary household soapless detergents should on no ac-

The illustration below shows the efficiency of soapless detergents as grease removers in dish washing as compared with the efficiency of soap or soap powder (illustration above on opposite page).

count be used on the hair unless their suitability for hair shampoos is stated.

Laundering of Delicate Fabrics

Delicate fabrics are those which require care in handling to preserve their colour and texture. These will include such materials as fine lingerie, hosiery, laces, silks, delicate rayons, nylons, woollens, and coloured fabrics which may fade or bleed if not carefully laundered.

Regardless of whether a pure mild soap or a soapless detergent is used it is important to remember that only lukewarm water should be used for washing delicate fabrics. Most of them require hand washing, as an automatic washer may injure the fibres. However, some articles can be laundered by machine if they are placed in a bag which can be securely tied, provided it is made from a material which will allow the cleansing solution to enter freely.

When soiled white fabrics made from cotton or linen are being laundered a slight degree of alkalinity seems to aid in removing dirt. As soap has a more effective action in alkaline solutions, it would appear that soap is the best detergent to use in the laundering of such fabrics. On the other hand wool is adversely affected by alkaline conditions, so that for woollen goods a soapless detergent is a more satisfactory cleansing agent than soap. To ensure long life of delicate fabrics it is wise to allow them to become only lightly soiled before they are washed, as surface dirt is then readily removed and consequently the fabric fibres are less likely to be injured.

Where a garment has a fibre-content label on it when purchased or a label with laundering instructions the buyer should be sure to follow these instructions. For dress material such information should be available from the store where it is bought and failing that from the manufacturer.

Household Cleaning Materials

The housewife has the choice of many detergents for her household cleaning tasks, including bar soaps, soap flakes, powders, granules, and liquid and powder soapless detergents. If she is wise, she will have a selection of several different types, each suited to a particular task.

Dishwashing is a job which seems never ending and much time and energy are wasted if the housewife has to struggle with hard-water problems. This can be eliminated by the use of a soapless detergent, which forms no sticky scum with hard water and cuts grease effectively; if it is used with really hot water, the dishes require little or no drying. However, as soapless detergents are efficient grease solvents, care should be taken not to use too much detergent in the dishwashing water, because the hands may become rather dry as a result of the removal of natural oil from the skin. Provided the quantity recommended on the packet or bottle is used, there should be no ill effects.

For general scrubbing and scouring of woodwork soap is a most effective cleanser and provided the wood is thoroughly rinsed to remove traces of suds, a smooth white surface will result. For cleaning of painted wood and tiles, however, soapless detergents are invaluable. They are economical and quick to use and leave the surface bright and clean. Soapless detergents are highly effective for the cleaning of leather and leather cloth, textile upholstery, and for carpets and curtains, as well as for painted, tiled, plastic, or metal surfaces.

All photographs by Sparrow.

Knitted Bed Jacket

A WARM and comfortable bed jacket is a useful item in any woman's wardrobe, particularly during times of sickness. The bed jacket illustrated at right is both practical and attractive and is easily made. The pattern given is for a 36in. to 38in. bust.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); rep., repeat; cont., continue; st.st., stocking stitch (1 row k., 1 row p.); inc., increase.

Materials: 15oz. of light blue 4-ply knitting wool; 1 pair of No. 10 knitting needles; 1 No. 10 and 1 No. 12 circular knitting needle; remnants of fine white wool for border embroidery.

Pattern: Using st.st. k. right side and p. wrong side of work.

The Back

Cast on 126 st. Begin work in st.st. for 1½in. Inc. 1 st. at both ends of row and rep. every 10th row, five times. Begin shaping armholes when work measures 8½in. The total number of st. is then 136.

To shape armholes cast off 5 st., then twice 2 st., and twice 1 st. each side. Cont. straight until armholes measure 7½in. Cast off for shoulders four times 6 st. and twice 7 st. each side and cast off remaining 38 st.

The Front

Cast on 90 st. Work straight in st.st. for 8½in. To shape armhole cast off first 8 st., then 5 st., 3 st., 2 st., and three times 1 st. After completion of the shaping of the armhole (in 15 rows) p. back. K. next row as follows: K. 2, * k. 2 together, k. 2. Rep. ten times from *; finish row.

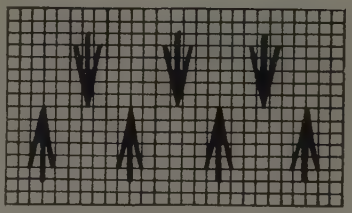
Cont. straight in st.st. until armhole measures 6in. Then begin shaping neckline by casting off 8 st., 3 st., twice 2 st., and twice 1 st. Cont. straight until armhole measures 7½in. Cast off for shoulder (beginning at armhole edge) four times 6 st. and twice 7 st.

Work other half to correspond with half described above.

The Sleeves

Cast on 54 st. and work straight in st.st. for 2½in. Then inc. 34 st. evenly distributed over needle and cont. straight in st.st., inc. every 8th row 1 st. at both ends of needles, 14 times. Cont. until length of sleeves is 19¾in. The total number of st. is then 110.

Shape sleeve top as follows: 1st row: Cast off 4 st., k. 2nd row: Cast off 4 st., p. 3rd row: Cast off 3 st., k. 4th row: Cast off 3 st., p. 5th row: Cast off 2 st., k. 6th row: Cast off 2 st., p. 7th row: Cast off 1 st., k. 8th row: Cast off 1 st., p. Rep. 7th and 8th rows 21 times. 51st row: Cast off 2 st., k. 52nd row: Cast off 2 st., p. Rep. 51st and 52nd rows twice. 57th row: Cast off 3 st., k. 58th row: Cast off 3 st., p. Rep. 57th and 58th rows once. 61st row: Cast off 4 st., k. 62nd row: Cast off 4 st., p. Cast off remaining 22 st.



The Border and Making up

Press all parts very lightly on wrong side and sew together. Take up st. all along border with a No. 12 circular needle and k. 32 rows with a No. 10 circular needle. Cast off loosely.

Embroidery (see illustration at left) is done between the 14th and 27th rows only; that is, the first 14 rows and the last 6 rows are not embroidered. The wool should be used double. Fold and sew on to front. Work cuffs in same manner.

Darning Table Linen

WORN table linen may be neatly and quickly darned by machine. Most makes of sewing machines have darning attachments which allow the operator to move the material backwards and forwards as well as from side to side. Sometimes the feed dog which grips the material from underneath is covered with a flat metal plate, and other machines make provision for lowering the feed dogs. The material may then be moved freely by hand as the machine stitches. The stitches should be of medium size with a corresponding medium tension, and the darning should always be done along the grain of the material.

The illustration shows a simple darning attachment which replaces the ordinary presser foot on the machine.

—BETTY M. JOHNSTON,
Field Officer in Rural Sociology, Department of Agriculture, Wellington

Hems and Hem Finishes

By ELIZABETH LAURENSON, Field Officer in Rural Sociology, Department of Agriculture, Auckland

THE aim of every home dressmaker is to produce a garment which when finished will have as professional a look as possible. To achieve this effect care must be taken with every step in the construction of the garment. Nothing can mar the attractive appearance of a dress or a skirt as much as an uneven hem. Unless the hem is finished in such a way as to provide decoration it should be as inconspicuous as possible. In this article the method of marking the hemline and ways of finishing hems are discussed.

THE last stage in the construction of any garment is turning up the hem. Whether the garment is a dress or a skirt, the waist must be finished completely before this can be done. This means that in the making of a skirt the side opening and the waist band must be finished. In the making of a dress the side opening must be finished and if the dress has a belt, this must be worn when the hemline is marked, as the skirt may hang differently without the belt. It is very important that when the garment is being fitted the undergarments worn are those which will be worn when the garment is completed. The shoes worn should also be those which will be worn later with the garment.

If the skirt is circular or has sections which are not on the straight grain, the garment must be left to hang for several days so that the bias sections drop. This must be done before the hemline is marked; otherwise it will be necessary to level the hem again after the garment has been worn several times.

Skirt Length

Skirt lengths are always changing and there is no hard-and-fast rule about the suitable length of a skirt. What is the height of fashion one season may be dowdy next season. The length of the garment is measured from the floor. Usually anything from 12in. to 14in. from the ground is a good length, but this is an individual matter which can be decided only by the wearer. The best length is usually that which looks best. The same distance from the floor will not be right for all figures, and often the best length can be decided only by marking the hemline, turning up the hem roughly, and viewing the result in a mirror. If at this stage the proportion of blouse to skirt does not look correct, letting down or taking up the skirt by ½in. may make the necessary difference.

Marking the Hemline

Marking the hemline will be simple if another member of the family is available to assist. It will be easier if the wearer stands on a table rather than on the floor, as the person who is marking is then able to sit comfortably

The method used to mark a hemline when another person is available to assist.

and view the hemline at eye level. A yardstick may be used to measure the exact distance from the floor or a hem marker can be used. A marker is most convenient, as it is not necessary to hold it upright and mark the hem at the same time. It is like a ruler marked in inches and set vertically on a wooden base.

When the length of the garment has been decided on it is marked by a row of pins put in the garment at regular intervals. Care should be taken to see that the skirt is not pulled unevenly when the pins are being put in, and the wearer should stand upright and still.

The home dressmaker who has no one to assist her may find it worth while to invest in a hem marker which will mark the hem for her. This is more expensive than the ordinary type but is a great help. It consists of a metal ruler marked in centimetres and set vertically on a metal stand. A small metal box containing powdered french chalk is attached to the ruler and can be set at any level on it. When the box has been set at the required distance from the floor the wearer forces puffs of chalk from it by squeezing a rubber bulb attached to the box by a length of rubber tubing. This makes a white line on the garment. It is only necessary for the wearer to turn her body to obtain a continuous, even line around the garment.

Turning up the Hem

After the hemline has been marked the skirt is turned up on the hemline to the inside of the garment, care being taken to see that the seams are kept in line. A row of pins is put along the fold and then a line of tacking is done close to the fold so that the edge is free to be trimmed.

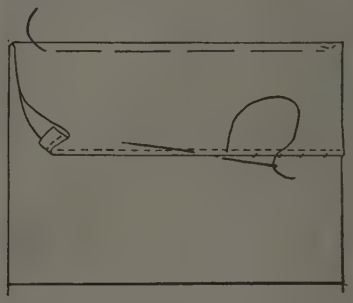
An Even Hem

The hem itself should be even in width, and the use of a cardboard gauge will ensure that the hem is marked and trimmed evenly. A gauge can easily be made by the home dressmaker, its size depending on the required depth of hem of the particular garment. The width of the hem is marked with pins, and uneven edges are trimmed away. (See photograph on page 97.)

Hem Finishes

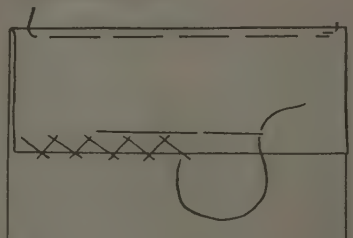
The way in which the hem of the garment is finished will depend on the type of fabric that has been used. A woollen fabric will require a different finish from a cotton or silk fabric, and the hem of a circular skirt will also require different treatment from the hem of a straight skirt. The object always is to have a hem which is as inconspicuous as possible on the right side of the garment. Stitches should be invisible on the outside.

Slip-stitched Hem

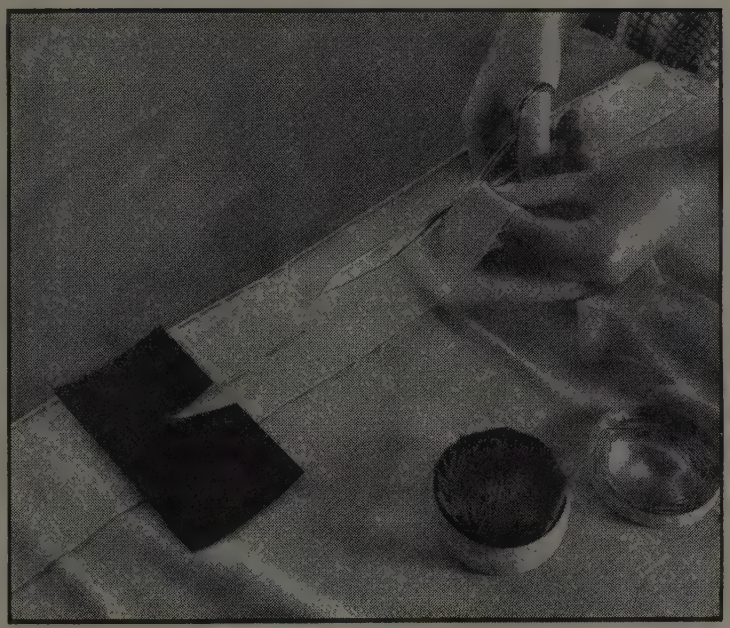


With a slip-stitched hem the raw edge is turned under and a row of machine stitching is done close to the turned-in edge to prevent the fabric from fraying. The hem is next pinned and then tacked in place. The pins should be put in at right angles to the hemline to ensure that the hem does not slip. The hem is then slip-stitched by running the needle inside the turned edge and taking up one or two threads of the outside material so that stitches are not obvious on the right side. This finish is used for cotton, firmly woven silk and rayon fabrics, and nylon.

Catch-stitched Hem



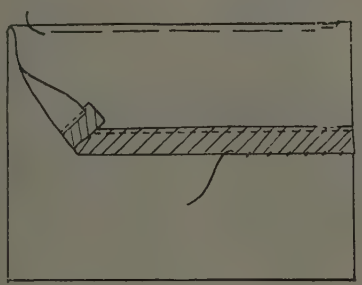
The catch-stitched hem is used for woollens or for heavy fabrics which do not fray. The raw edge may be cut evenly or may be pinked. The hem is first pinned and tacked and the catch-stitch is worked from left to



Trimming a hemline, showing the use of a cardboard gauge to obtain a straight edge.

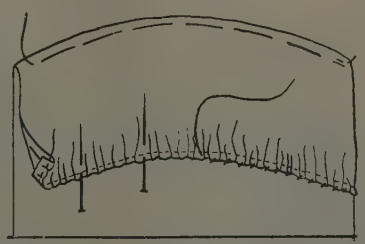
right. One thread in the hem is caught by inserting the needle from right to left and then one thread is caught in the garment by inserting the needle from right to left. This is repeated around the hem, making a zig-zag effect.

Hem Finished with Seam Binding



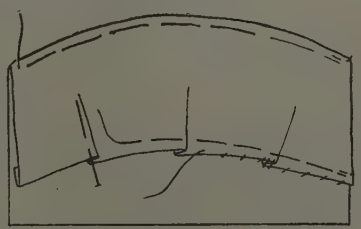
If the fabric is liable to fray easily, the hem may be finished with seam binding. This finish may be used for woollens or for heavier cottons, linens, and rayons. One edge of the seam binding is pinned and tacked flat to the raw edge of the hem and is then machine stitched into position. The other edge of the binding is then tacked and hemmed to the garment. This gives a very firm, neat finish.

Gathered Circular Hem



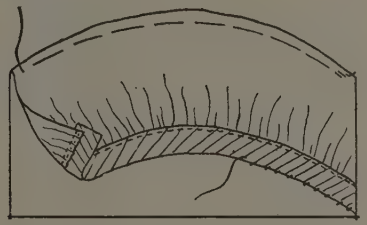
When the top of the hem is too full to lie flat the fullness must be controlled evenly. For cotton fabrics, silk, rayon, and nylon the raw edge may be turned under and gathered with a running stitch or machine gathered. The fullness is then distributed evenly around the hem. The hem is pinned in place, tacked, and hemmed.

Pleated Circular Hem



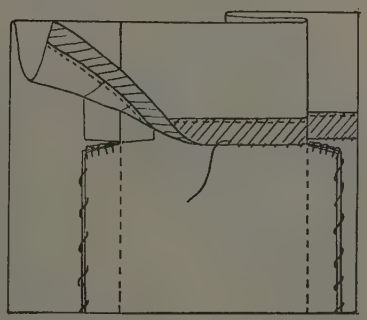
A pleated circular hem can be done with cotton, silk, rayon, or nylon fabrics in place of gathering. The fullness at the top of the hem is taken up by tiny pleats. The pleats must be even and not too large so that there are no corners on the hemline. The raw edge is turned in and the hem is pinned, tacked, and stitched invisibly, each pleat being caught with several stitches.

Taped Circular Hem



Taping gives a less bulky finish for a circular hem, particularly if the fabric is heavy cotton, linen, or wool. The top of the hem is gathered either with running stitch or machine gathering. The raw edge is not turned in first. If the garment is woollen, it may be possible to shrink out the gathers with a damp cloth and hot iron. Care must be taken to keep the moisture and heat away from the outside of the garment, as this must not shrink. The outside may be protected by placing paper and a towel between the hem and the outside while the hem is being pressed. The seam binding is then pinned and stitched to the raw edge. Finally the hem is pinned in place, tacked, and the binding is hemmed to the garment.

Hem in Pleated Skirt



The seam under a pleat should not be open except under the hem. This is because the seam helps to hold the fold of the pleat in place. The seam allowance should be clipped across to the line of stitching at the top of the hem. The seam is pressed open in the hem and the cut ends are neatened with buttonhole stitch. The raw edge of the hem is finished by being turned in and machined close to the edge or by use of seam binding and is then hemmed to the garment.

All photographs by Sparrow.

Home-made Unboiled Sweets

By MAUD B. STRAIN, Field Officer in Rural Sociology, Department of Agriculture, Dunedin

MOST people are at one time or another called on to make sweets for some family celebration, to help stock a stall at a bazaar or flower show, where they always find a ready sale, or as an individual present which reflects time and thought in the preparation of something with a definitely personal touch. Fudges, nougats, caramels, and toffees in their great variety are always popular; however, they demand a fair degree of accuracy in cooking times and temperatures if a perfect result is to be achieved. Less exacting are unboiled sweets. These may require gentle heat for a few minutes to combine the ingredients more readily, but no accurate temperatures or cooking times. No special aptitude or apparatus is necessary. To make attractive sweets calls for a little care and some originality in giving the finishing touches.

IN the making of sweets the fundamental principles are to select the best ingredients and to have everything scrupulously clean. There is no place in cookery where inferior materials are reflected more conspicuously than in candy. The cooking tools usually found in the kitchen will suffice, though a chocolate dipper is handy. However, a two-pronged kitchen fork will serve the same purpose, or a dipper could be fashioned from a piece of wire looped at one end.

Icing sugar is the main ingredient in a large number of unboiled sweets. To make it completely free from lumps it should be rolled out and sieved before it is used.

The basis of many uncooked candies is either marzipan (almond paste) or fondant. Fondant is frequently made by boiling together sugar and water with a small amount of glucose, lemon juice, or cream of tartar until it reaches the soft ball stage and then cooling and beating it. The fondant in the following recipes is made by a different method and requires no boiling.

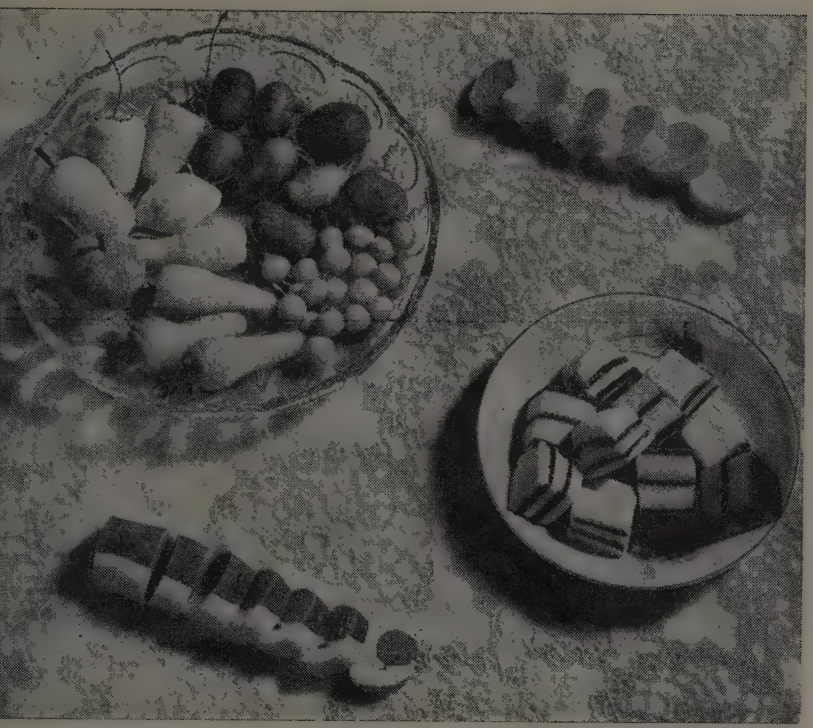
An assortment of food colourings and flavours, coloured sugar and coconut, and the use of dried fruits, crystallised fruits, and nuts (either as an essential ingredient or for decoration) will help to give a gay appearance and to avoid too much similarity of taste.

To colour sugar place some white sugar in a saucer and sprinkle a few drops of the desired food colouring over it. Work this in with a wooden spoon or the fingers until the sugar is evenly coloured. Dry it off carefully in a cool oven and store it in an airtight container.

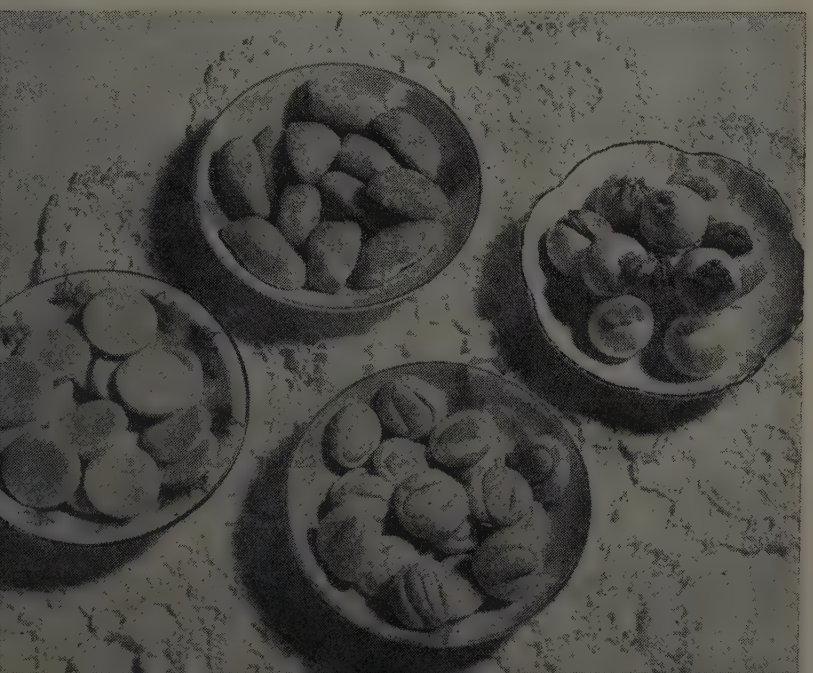
Coconut may be done in the same way.

To blanch almonds place shelled almonds in a basin and pour boiling water over them. Allow them to stand for a few minutes and then pour the water off. The outer skins will then slip off easily. Blanched almonds may be cut lengthwise in shreds or strips, cut across in thin slices, chopped coarsely or finely with a knife on a chopping board, or ground by being put through a mincer or being pounded in a mortar.

To prepare figs and prunes for stuffing steam them for 15 minutes or until plump and soft. Remove the stones



Above—The glass dish contains marzipan still-lifes and the smaller dish holds liquorice sweets made from left-over scraps of marzipan and fondant between strips of ribbon liquorice. At upper right is a marzipan harlequin roll and at lower left is fondant almost encircling a strip of chocolate fondant. Below—Peppermint creams or after-dinner mints (left), mocha walnuts (upper middle), almond marzipan patties (middle), and cherry bonbons (right). Photographs on this page and on opposite page by Campbell.



from the prunes and cut slits in the sides of the figs.

Fondant Sweets

Basic Fondant

1lb. of icing sugar
1 egg white
1 teaspoon of lemon juice
½ teaspoon of cream of tartar

Sift the icing sugar. Add the lemon juice, cream of tartar, and egg white slightly beaten. Mix these together to form a paste that can be moulded in the hands. Add more icing sugar as required. Turn the mixture on to waxed paper dusted with icing sugar and knead it to a smooth, even paste; allow it to stand for an hour or more before using it.

Bonbons

Add any desired flavour and colour to a quantity of fondant and knead them thoroughly into the fondant until it is uniformly coloured and flavoured. Break off small pieces and form or cut them into balls, strips, patties, or whatever shapes may be desired. Allow the pieces to stand for several hours to set.

Fruit Fondant

Into 1lb. of basic fondant knead the following: Chopped raisins, dates, figs, crystallised cherries, preserved ginger, and similar fruits. Press into a flat cake about 1in. thick and cut into bars. These may be dipped in melted chocolate if desired.

Variation: Chopped blanched almonds, walnuts, or mixed nuts may be used in place of or in combination with the fruit in the preceding recipe.

Nut Creams

Roll basic fondant coloured faintly pink or green and flavoured with almond essence into balls and flatten each with a blanched almond pressed firmly on top. Alternatively, join two walnut halves with a piece of fondant.

Date Creams

Remove the stones from dates and pack the resulting cavities with fondant. The filled dates may be left plain or soaked in a little sherry for 10 minutes, drained, and rolled in coconut.

Peppermint Creams (After-dinner Mints)

Flavour some plain fondant with peppermint extract or oil of peppermint, colour it faintly green, roll it out about ¼in. thick, and cut it into rounds with a small cutter. Leave it to harden. (Oil of peppermint is a particularly strong essence and should be used with discretion.)

Mocha Walnuts or Brazils

Work a few drops of coffee essence into basic fondant. Break off small pieces of fondant, flatten them out, and cover half walnuts or whole brazil nuts with them so that the nuts are thickly coated. Roll in castor sugar and leave to harden.

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NANZS

Cherry Bonbons

Colour some basic fondant pale pink and flavour it with almond essence. Wrap the fondant round crystallised cherries and on the top of each place a small piece of walnut or blanched almond. Roll the bonbons in castor sugar, and allow them to harden.

Harlequin Bars

Divide basic fondant into four equal portions. Colour one part faintly green and flavour with peppermint, colour the second part pink and flavour with almond, colour the third part with coffee essence, and leave the fourth part plain. Bits of fondant left over from the making of other sweets could also be used. Roll each portion into a cylinder, place two cylinders alongside each other and two more on top, roll them all together into a "log", leave to set, and cut into rolls ½in. thick.

Marzipan Sweets

Basic Marzipan (Almond Paste)

2 egg whites (or one whole egg, which gives a yellow colour)
½lb. of ground almonds
1lb. of icing sugar

Combine the ground almonds, icing sugar, and slightly beaten egg whites in a basin over hot water to form a stiff paste. Turn on to a waxed paper dusted with icing sugar and knead to a smooth, even consistency. Allow this paste to stand for an hour to cool thoroughly. Take any quantity of this and colour suitably and form into dainty shapes or roll out and cut with small cutters.

Marzipan Still-lifes

With a good smooth marzipan paste, a variety of food colouring, and some ingenuity it is possible to mould sweets the shapes of almost any kind of vegetable, flower, or fruit.

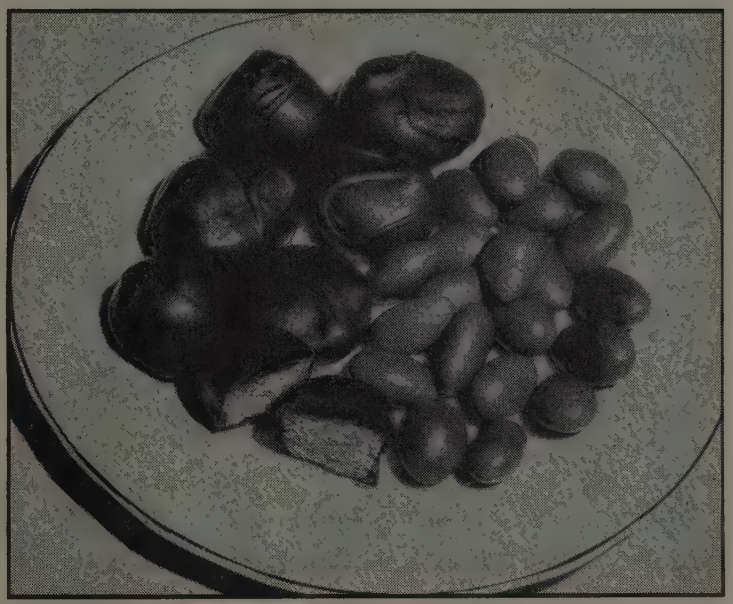
Strawberries: Colour marzipan deep pink, shape like strawberries, and make a number of small pits over the surface with the blunt end of a toothpick to resemble the seeds of the real fruit. Make hulls (the green portions at the bases of the berries) of green marzipan or angelica and roll the sweets in castor sugar.

Apples are moulded into shape and diluted food colouring is applied to the outside with a small brush to give a realistic colouring.

Pears are similarly moulded. Cloves may be used for the stem and blossom ends.

Other fruits and flowers may be fashioned similarly.

Cherry flowers are made by pressing crystallised cherries on to pieces of marzipan coloured pink and cut out with a fancy cutter into petal shapes, or the cherries may be stuffed with marzipan by making right-angled cuts (not right through) in the tops of cherries, separating the cut edges, and inserting a ball of marzipan.



Chocolate-coated marzipan and fondant centres (left) and chocolate almonds (right).

Stuffed Fruits

Dates, prunes, and figs can all be stuffed with marzipan.

Brown-eyed Susans

Wrap a layer of pale yellow marzipan round a cylinder of chocolate fondant, allow it to set, and cut it into rounds ½in. thick.

Chocolate Sweets

Coating Chocolate

4oz. of plain chocolate
2 or 3 drops of olive oil

Grate the chocolate coarsely and melt it over hot water. Add the oil, remove from the heat, and beat well until the chocolate is of thick-coating consistency and only very slightly warm. Re-warming during dipping may be necessary or the bowl can be kept over warm water, but care must be taken to avoid over-warming.

Dipping

Drop the centres one at a time in the chocolate. Coat each one, shake off any surplus chocolate, and place the chocolates on waxed paper. Peppermint creams, mocha walnuts, nut creams, and other fondant and marzipan sweets may be dipped in chocolate.

Conditions for Chocolate Dipping

A dry, warm atmosphere is essential. Most kitchens are suitable, but there must be no steam in the room. Excess moisture in the air will cause whitish spots and streaks in the set chocolate. The same mottled appearance will occur if chocolate is used too warm. If the temperature is too high, the chocolate runs too much to give a thick coating and takes a long time to dry. At the right temperature the first piece should be dry by the time the fourth or fifth centre has been dipped. Most plain or milk chocolate can be used for dipping.

Soft Chocolate Centres

4oz. of plain chocolate
1 tablespoon of coffee essence
1 dessertspoon of cream
1 dessertspoon of brandy

Grate the chocolate coarsely and melt it in a basin over hot water. Stir in the coffee essence, cream, and brandy. Remove from the heat and beat well until cool and firm. Shape the centres into ovals or balls and leave them on waxed paper until dry. Dip in melted chocolate.

Chocolate Bonbons

4oz. of grated dark chocolate
½lb. of basic fondant (vanilla flavoured)

Work the grated chocolate into the fondant. Form into small balls, dry, and dip in melted chocolate.

Chocolate Fruit Drops

6oz. of plain chocolate
2oz. of sultanas
6oz. of stoned dates
1oz. of shelled walnuts

Grate the chocolate and melt it in a basin over hot water. Stir in chopped fruit and nuts. Remove the mixture from the heat and drop with

Sugared orange rind served with coffee.

a teaspoon small heaps of it on waxed paper. Top the drops with pieces of glace cherry or chopped nuts.

Chocolate Almonds

½lb. of almonds
Coating chocolate

Blanch the almonds and put them on a baking pan in the oven. Remove them when they are slightly browned. When the almonds are cold dip them in melted coating chocolate and drop on to a pan to harden.

Chocolate Fruit Bars

½ cup of stoned dates
½ cup of seedless raisins
1 cup of chopped mixed peel
½ cup of currants
½ cup of blanched almonds
1 egg white
2 tablespoons of water
Icing sugar
1 teaspoon of vanilla extract
Melted chocolate

Put all fruits and nuts through a mincer. Place the egg white in a bowl and add the water, vanilla extract, fruits, and enough icing sugar to form a stiff paste. Pat out in a shallow greased pan. Let the mixture dry for 4 hours and brush melted chocolate over it.

Assorted Sweets

Date Nut Fondant

½ tin of sweetened condensed milk
1 teaspoon of vanilla extract
1½lb. of icing sugar
1 cup of chopped walnuts
½ cup of chopped dates

Combine the sweetened condensed milk and vanilla. Add the icing sugar gradually and mix until smooth and creamy. Add the chopped nuts and dates and blend well together. Press the mixture into a shallow pan (about 8in. x 8in. x 2in.). Chill until firm. Cut into 1in. pieces.

Peanut Butter Fudge

½ cup of condensed milk
1½ tablespoons of peanut butter
1¾ cups of icing sugar
½ teaspoon of vanilla

Put the milk and peanut butter over boiling water in the top of a double boiler. Mix to a smooth consistency. Stir in the icing sugar and vanilla and pour the mixture into a small shallow pan and chill until firm. Cut into squares.

Variation: For chocolate peanut fudge mix 1oz. of cocoa in with the icing sugar in the above recipe.

Fruit Balls

2oz. of candied peel
2oz. of sultanas
2oz. of seeded raisins
2oz. of stoned dates
2oz. of almonds
2oz. of walnuts
Juice of 1 lemon
Coconut

Put the fruit and nuts through the mincer, add the lemon juice, and mix all the ingredients thoroughly. Roll into balls and coat with coconut.

Spiced Stuffed Prunes

½lb. of prunes
1oz. of sugar
¼ cup of golden syrup
¼ cup of water
½ teaspoon of nutmeg
½ teaspoon of cinnamon
¼ teaspoon of allspice
3 to 6 cloves
Chopped nuts and raisins
Condensed milk

Soak the prunes in water overnight and wash thoroughly. Drain well and add sugar, water, and spices and golden syrup. Simmer the mixture slowly until the prunes have absorbed all the syrup. Slit the prunes, remove the stones, and fill the spaces with chopped nuts and raisins mixed with condensed milk. Roll the prunes in castor sugar and leave to dry.

Rum Titbits

½lb. of plain chocolate
Few drops of rum
Grated chocolate
1 tablespoon of condensed milk

Melt the chocolate over hot water. Add the rum and milk. Beat the mixture well and leave it in a cool place until stiff enough to handle. Shape into balls and roll in grated chocolate. The titbits may be wrapped in waxed paper or put in paper cups.

Sugared Citrus Rinds

Remove the rind from grapefruit or oranges in four lengthwise sections and cut each section into four strips with scissors. Place strips in a saucepan and cover with cold water. Bring to boiling point and boil for 10 minutes with the saucepan uncovered. Drain. Repeat this process twice more, then drain thoroughly, weigh the rind, place it in a saucepan, and add an equal weight of sugar. Place over low heat and cook slowly, stirring often with a fork until the rind is translucent and shiny (about 30 minutes). Remove from heat. Lift out the separate pieces with a fork on to waxed paper and sprinkle with sugar. Store the pieces between layers of waxed paper in a tightly closed container.

Frosted Fruit

1 egg white
1 teaspoon of water
Sugar
Small bunches of fruit

Beat the egg white until stiff and add the water. Sprinkle some sugar on a sheet of clean paper. Dip some bunches of fruit, for example, currants or grapes, into the egg white and then into the sugar on the paper and shake sugar over them. Place the frosted fruit on a wire rack to dry.

Salted Almonds

½lb. of shelled almonds
Salt
2 tablespoons of melted butter

Blanch the almonds and dry them in a clean cloth. Heat the almonds in the melted butter until they are evenly and delicately browned. Drain them on kitchen paper and sprinkle with salt.

Packing Gift Boxes

Attractive packing is a major part of the work in making sweets for gifts. Waxed paper, transparent cellulose wrapping, lace-like edgings, and similar decorative aids are readily available to disguise and embellish empty chocolate boxes. Sweets may be individually wrapped or placed in small paper cups. Waxed paper should separate the layers in the box and the rows in each layer.

Home-made sweets should be eaten while fresh; they are not designed for long keeping and tend to deteriorate more quickly than the bought varieties.

Frames, Cloches, and Shade Houses in the Flower Garden

MOST flower gardeners would like to raise their own plants both for the pleasure it gives and to save money. In most areas of New Zealand protection of young plants is needed. Drying winds can often be more damaging than frost, and in summer seedlings and cuttings need protection from excessive heat. In the first part of this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes the construction and use of frames, cloches, and shade houses which the home gardener can use to advantage in growing his own plants from seeds or cuttings. The section on routine garden work for August is by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch.

EVEN if the home gardener has a glasshouse where plants can be grown from seed or cuttings, it is necessary to transfer them as they grow to some form of shelter outside. Here they will have more suitable growing conditions than in a glasshouse.

In the North Island at least a glasshouse in summer can be too hot for the majority of pot plants unless it is heavily shaded. Many of these plants grow better outside, either in well-ventilated frames or in a shade house.

In the raising of plants from seeds or cuttings, frames and cloches make an excellent substitute for a glasshouse. Most hardy and half-hardy plants can be raised in them, though plants such as begonia, lobelia, and Iceland poppy, whose seeds are very small, should be sown in boxes in a glasshouse, as the seeds and seedlings need frequent attention to watering and shading.

Construction of Frames

In a small garden a frame will be very valuable. Many home gardeners make quite satisfactory frames out of window sashes set on a simple wooden framework. Even in the smallest garden many plants can be propagated by placing bottomless boxes on the soil and covering the open tops completely with sheets of glass.

Simple frames like these are especially valuable where space is limited, as they can be set up in a sunny position in spring for seedling raising and then moved to a more shaded position for seed sowing or propagating of cuttings in early summer.

Types of Frames

The standard English frame consists of permanent solid walls of brick, concrete, or wood on which is laid a 6ft. x 4ft. frame light or sash. In the average home garden a frame light of this size is too heavy and cumbersome for general use.

Smaller frames and smaller lights, made from thinner timber and large panes of glass, are much more convenient; they can be lifted easily and can be secured when open without the danger of their being blown off by wind. Frames wider than 4ft. from front to back are too wide for easy management, especially if the light is hinged at the back.

The Dutch light consists of a single sheet of glass 56in. long and 29in. wide set in a wooden framework 59in. long by 31⅜in. wide. This is easy to handle and allows the maximum amount of light to enter, but it must be held firmly in position at all times, as it can be blown off in windy weather.

The best size of frame for a home gardener is 4ft. from side to side and 3ft. from back to front. The walls can be built of permanent materials such as bricks or hollow concrete blocks or made of well-seasoned timber.

Unless pot plants are to be grown in the frame the backboard should not be more than 9in. high and the front board 6in. high, measured from the soil surface. Faults to be avoided in the building of a frame are:—

Making the backboard much higher than the front.

Making the frame too deep.

Using one heavy frame light rather than two smaller ones.

Preferably the light should slide on and off the frame rather than be hinged at the back. It should be hinged only if there is no room for the light behind the frame. Where a light is hinged the plants at the back of the frame sometimes get neglected, and if the wind blows from the front of the light, ventilation is difficult, because plants can be easily damaged by draughts or gusts of wind.

New wooden frames and lights should be treated with a wood preservative of copper naphthanate or painted with red lead and a good exterior paint. Creosote should not be

[*Campbell*

A large, deep permanent frame used for plunging pot plants, such as these chrysanthemums. The block of wood holds open the frame light when the frame is being ventilated.

These small frame lights are easily lifted. The uprights hinged to the frames can be hooked over the permanent piping for various openings.

used, as it gives off damaging fumes in an enclosed space like a frame.

Frame Lights or Sashes

Frame lights or sashes can be of many types, varying from window sashes to well-made mortised lights. In all types the glass sheets should overlap and provision should be made for rain to run right off the light on to the ground outside the frame. Many home gardeners build their own lights from spare pieces of glass; the new glass bedding materials are an improvement on putty for bedding the glass on to the woodwork and top sealing the glass. These materials allow broken or cracked sheets of glass to be replaced easily.

Glass substitutes now available can be tacked on to the wooden framework of a light in place of glass. The life of such substitutes is usually shorter than that of a well-maintained glass light. Glass substitutes can be used to make portable frame lights, to make temporary side walls in ranges of frames, or to block the ends of cloches. Any flexible material such as scrim, cheesecloth, or glass substitute must be tacked on to a wooden framework. If it hangs loosely, it will blow about, become torn and dirty, and may damage the plants.

Management of Frames

Frames should be set up near a path so that all work can be carried out from a firm, dry surface. It is unpleasant and even dangerous to try to handle plants in a frame when the ground in front is puddled and slippery. Water running off the frame light will make the area round the frame very wet unless it is well drained and kept free of weeds by regular hoeing.

Frames should slope to the north when used in spring for plant raising and should be either very well shaded or slope to the south in summer for propagation or for holding pot plants.

Weeding

As growing conditions are very favourable, weeds flourish in and round frames. Whenever plants are removed from a frame or pots and boxes are shifted weeding should be done at the same time; a rubbish tin should always be at hand when plants in a frame are being attended to so that weeds and leaves can be dropped into the tin and taken to the compost heap immediately afterward. The area round a frame should always be kept clean by regular hoeing, and even if the frame is not in use, weeds should be removed regularly. Hygiene in frame management is very important. Weedkillers should never be used.

Ventilation

Ventilation is important with frames. Where they are set up permanently and are hinged an overhead framework is the best way of holding the frame light open.

Where the light slides on runners the frame can be ventilated by placing blocks of wood or flower pots under the light. When blocked open, lights must be tied down or they will blow off in windy weather.

Use of Frames in Spring

Frames are of greatest value in spring for raising plants from seed. Many summer bedding plants and early vegetable plants can be raised easily and cheaply by sowing the seed directly into the soil in the frame.

For this purpose the soil should be specially prepared. Many garden soils lack organic matter and tend to "pan down" after heavy rain or watering; soil in such condition is quite unsuitable for raising plants from seed and the soil in the frame should be prepared in the same way as soil for seed boxes.

Ordinary garden soil can be used, but the texture should be improved by working in well-decayed leafmould or peat if available. Finely sifted compost can also be used, but should be sterilised by heating in an oven or copper or by having boiling water poured over it; otherwise many weed seeds will be introduced. Unless the soil is light and sandy, drainage and texture will be improved by adding coarse sand or scoria as well as organic matter. The only fertilisers usually needed are superphosphate, 3oz. per square yard, and lime, 1½oz. per square yard, worked into the soil with the organic matter and sand.

The soil in the frame should be prepared early in the season, well worked

down to break up lumps, and firmed and watered and the light put on the frame. If this work is done about 10 days before the first seeds are sown and the frame is kept closed, many weeds will germinate. Light hoeing of the surface will kill many of them before seed is sown. In addition the soil will have warmed up and be in a good physical condition for seed sowing.

Sowing Seed

Seed should be sown in drills across the frame. A label giving the date of sowing and name of the plant should be placed at one end of each drill and a small stick placed at the other end. Provided the soil has been properly prepared, drills can be taken out by pressing a narrow batten into the soil or by laying this batten on the soil and drawing a stout label across the soil.

Seed should not be sown too deeply; a drill depth of ¼in. is deep enough for all except the largest seed. Seed should always be sown thinly, as normally very good germination can be expected under these conditions. After sowing, the soil should be drawn back over the seed and lightly pressed down. As the soil will be fairly moist, no watering should be needed at this time, but as soon as the soil surface starts to dry the frame should be well watered.

If the weather is hot and sunny after sowing, cheesecloth or scrim should be tacked across the frame just below the frame light, or the inside of the light should be painted with a mixture of lime and skimmed milk to protect the seed from direct sunlight. As soon as the seeds are sown the frame should be closed completely until the first seed leaves emerge on the soil surface.

As the seedlings grow the scrim should be removed or the lime wash rubbed off and the frame ventilated at every opportunity. The frame need be closed only in frosty or cold, damp weather; if it is sunny and windy, ventilation should be given on the side away from the wind.

Thinning Seedlings

Unless the seed has been sown very thinly, seedlings will have to be thinned out to 1in. apart in the row, the weakest plants being removed or the row being reduced to one of single plants where they have germinated in clusters. Where space is available seedlings can be transplanted wider apart in the frame or under cloches. For 2 days after thinning or transplanting the frame should be shaded and only a slight amount of ventilation given.

Plants should be completely hardened off by the time they are ready to plant out. They should be well watered the day before they are transplanted.

USE OF FRAMES IN SUMMER

[*Campbell*

A scrim-covered framework will convert an ordinary frame to a shade frame in summer.

If a separate frame is available for cuttings, this can also be used in spring. Many herbaceous plants can be increased rapidly by lifting the clumps in spring, dividing them into separate shoots, and growing these on in the cutting frame for a month. By this means strong young plants will be available for planting in the herbaceous border or in newly made beds or borders.

Chrysanthemums especially make better plants and produce better blooms if raised from cuttings of young shoots in spring. If an old clump is left in the same place for several years or is just split up and replanted outside in spring, the plants deteriorate and the flowers become small and weak.

Use of Frames in Summer

From late July to the end of October the frame can be used for raising a succession of plants. Frequently spring bedding plants continue to flower later than is expected and the gardener cannot bring himself to pull them out when they are still flowering well. Spring bulbs may not have ripened their foliage sufficiently to allow their removal, especially if they cannot be heeled in elsewhere.

In such cases it is very useful to make a late sowing of summer bedding plants in the frame so that these are already well developed by the time they are set out for summer display. By the end of October it is better to sow most summer flowering plants where they are to bloom, and the frame will then need cleaning up. All weeds should be removed, dead leaves collected, and fresh soil mixture added. It is surprising how much soil is removed each time a plant is taken from the frame and set outside.

The frame can still be of use in summer for raising from seed such subjects as shrubs, herbaceous perennials, and spring bedding plants for the following season. At this time of year the glass light will not be needed and it should be replaced by a light made of scrim or cheesecloth or a framework of 1in. x ¼in. laths.

Summer Cuttings

Frames are most useful for raising plants from cuttings, though it is not possible to raise plants from seed and from cuttings in the same frame at the same time. Preferably a separate, small frame should be kept especially for cuttings. Even boxes placed on the soil and covered with glass are adequate.

The soil should be very well drained. If the soil in the garden frame is very heavy and badly drained, a special soil mixture should be made up of 2 parts of soil from old turf, 1 part of coarse sand, and ½ part of sifted leafmould. Coarse road metal should be laid in the base of the frame and 3in. of the soil mixture laid on top.

Where the soil in the frame is moderately well drained it can be improved by adding coarse sand and a small quantity of leafmould. Sufficient sand should be added to give a gritty feel to the soil when a sample is picked up and rubbed through the fingers.

Normally no fertilisers need be added when soil is prepared for cuttings. Once cuttings have rooted and are growing well they can be fed by watering occasionally with one of the

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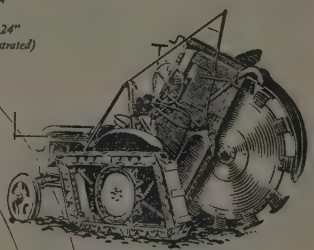

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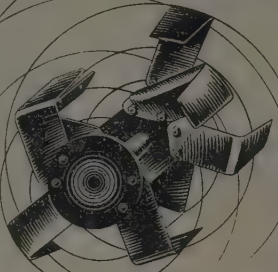

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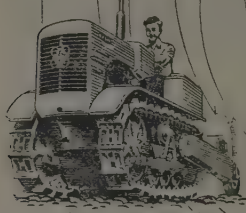

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soluble complete fertilisers now sold by all seedsmen.

Preferably the frame should face south or south-east, in summer, but if this is not possible, the light should be shaded with a lime wash or a scrim framework laid over the light.

Cuttings of evergreen shrubs and conifers should be taken when the base of the growth of the current season is firm and the tip of the shoot just firm, not soft and limp. Cuttings should be up to 3in. long. The basal leaves should be removed and the base dressed with a hormone root-promoting material.

The soil should be well firmed and thoroughly watered and the cuttings inserted in rows across the frame and well watered in. The glass light should then be set in place and shaded. The light should be kept closed for the first 10 days to 2 weeks, though it is advisable to inspect the frame and remove any leaves which have dropped off.

As soon as the cuttings lose their limp appearance and start making new growth from the tip a little ventilation can be given and increased as the young plants grow. Some shading will be needed in very hot weather, and at this time the light can be removed and strips of lath or brushwood laid across the frame.

By the end of March the plants should be well hardened off and transplanted to a nursery bed or potted off and plunged in a shade frame.

If only a few plants are wanted, cuttings can be struck under a preserving jar or jam jar in sandy soil in the garden. The same principles of firm planting, watering, shading, and ventilation apply even in this method.

Use of Frames in Autumn

The seed frame will not be of great use in autumn, as few plants are raised from seed at that time. If seed sowing in open ground has been delayed because the weather has been hot and dry, the frame can be used for raising hardy plants such as calendulas, stocks, pansies, and gaillardias. These will be ready to plant out when autumn rains make the ground suitable. For this purpose neither the frame light nor shading will be needed, provided the correct soil mixture is used and the frame is kept watered.

The cutting frame will still be valuable, and if not already full of shrub cuttings, it can be used for propagating herbaceous plants and leafy border plants such as carnations, gazanias, and thrift. These should be treated like softwood shrub cuttings and will need to be kept covered with the frame light for about a fortnight or until there are signs of new growth.

Use of Frames in Winter

In cooler districts dahlia tubers, chrysanthemum stools, and fibrous begonias can be lifted in autumn and bedded into a frame. They can be planted in soil or surrounded with well-rotted leafmould and sawdust. They should be lifted and divided in early spring before the annuals and bedding plants are sown. In districts where severe frost is experienced some protection will be required for the plants in the frame. When frost is forecast the plants can be protected by laying straw loosely over them beneath the glass light, or sacking can be laid on top of the light.

If frost penetrates the frame unexpectedly, damage to the plants can be reduced by allowing them to thaw out very slowly. The frame should be covered in the morning with sacking and a very slight amount of ventilation given. More damage will occur to the plants if the frame is kept closed or opened fully so that the morning sun causes the plants to thaw out quickly.

CLOCHES IN THE FLOWER GARDEN

[*Sparrow*

Tent cloches such as these can easily be made up from spare pieces of glass. They are useful for raising plants from seed or protecting small plants.

Cloches

Cloches are extremely useful in the garden and can be used in place of frames or as a supplement to frames, especially where a large number of plants is raised.

Construction of Cloches

There are four main types of cloches: Semi-circular plastic cloches, tent cloches, barn cloches, and rectangular cloches. The semi-circular plastic cloches are light and easy to handle and are normally held down by curved wires placed over the cloche and pushed into the ground. The smaller sizes are suitable only for seedling raising; the larger sizes can be used for crops of taller plants.

The tent cloche is like an inverted V. As the height is limited, it is again mainly suitable for raising seedling plants. Growing plants can be set out only down the centre of the cloche. Standard sizes may be bought, but it is also possible to make up cloches of one's own, using various clips to hold the two sheets of glass. Breakage of glass is quite a serious problem, especially on stony soils, but tent cloches are light and portable.

The barn cloche is like a miniature glasshouse and consists of 4 sheets of glass. The two side sheets slope slightly inward and the two top sheets slope more sharply inward to form a ridge. These cloches allow a greater range of crops to be grown, bringing to maturity crops under 2ft. high (the height of the ridge). Breakage of glass occurs also with this type and they are rather large for convenient handling. However, the range of crops which can be grown under this type

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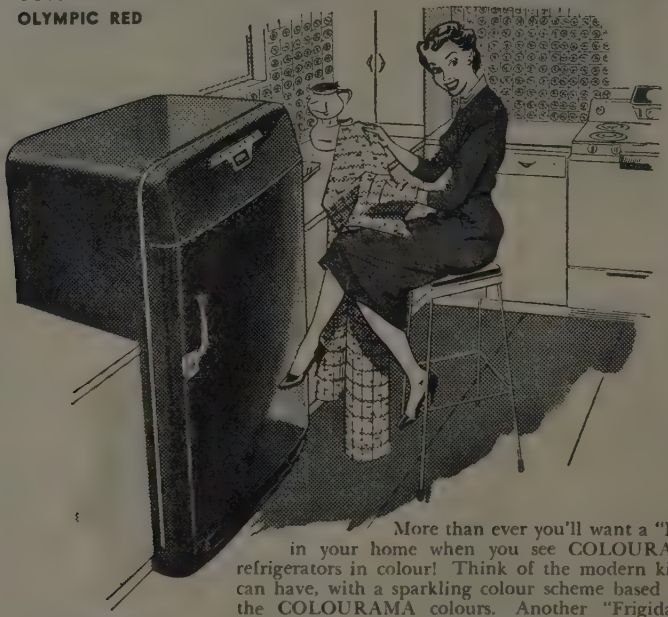

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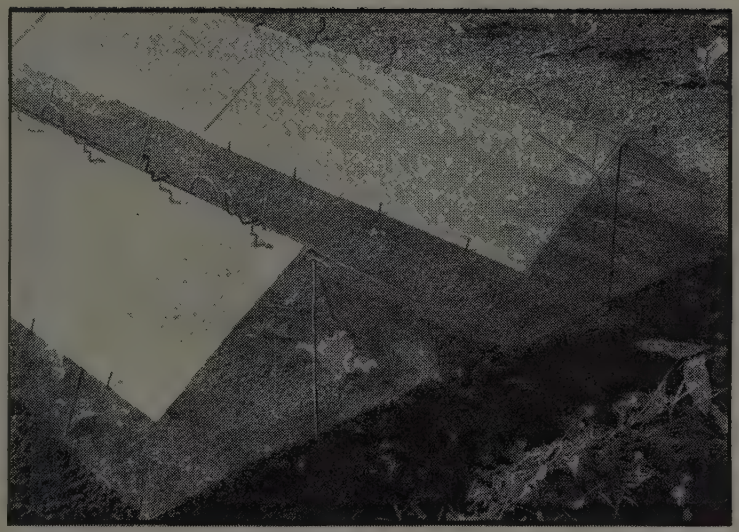


offsets their disadvantages. Modern types now have removable glass panels to permit handling of the crop without moving the cloche.

Rectangular cloches have straight glass sides and flat or sloping roof glass. The glass fits into a wooden or metal framework and the panes are usually easily moved or removed. This type of cloche is not at present commercially available in New Zealand, but some gardeners have constructed their own cloches on this pattern. Though more expensive than the types previously described, the rectangular cloche seems to have all the advantages of glass protection and few disadvantages except its cost. It can be used both for raising plants from seeds and cuttings and for growing plants to maturity.

Management of Cloches

Through careful planning and forethought it is possible to use cloches all the year round. Though at times they will be more valuable in the vegetable garden, they can be of great use in the flower garden.

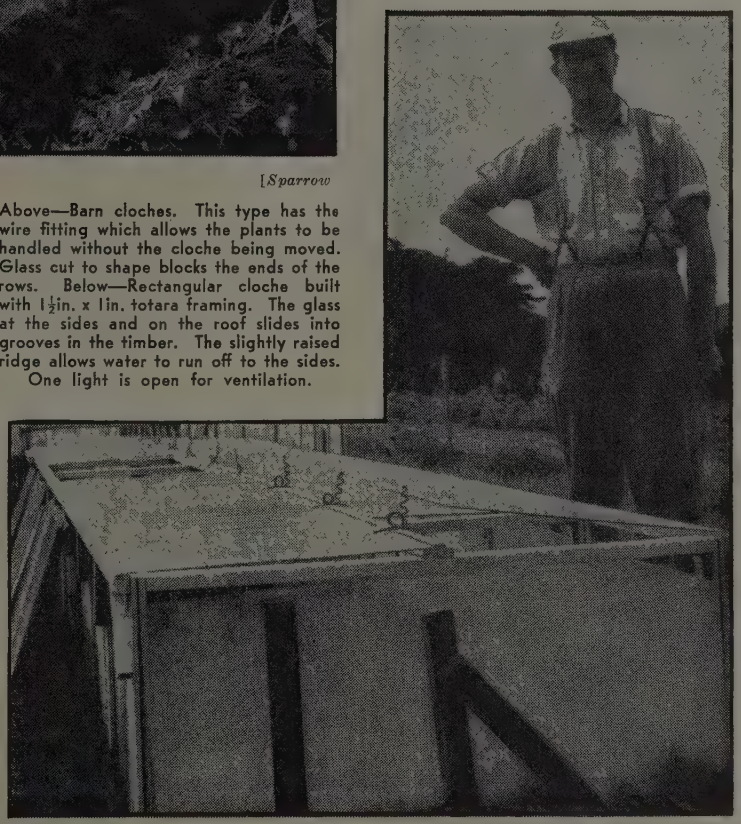
When cloches are used several points should be kept in mind. The soil should be well prepared and enriched with plenty of organic matter and it should be of higher fertility and more friable than in the open ground. Plants under cloches will require watering, especially when young, so the cloches should be set conveniently for watering.

As cloches are set up and used in the same place for some time, the soil on either side tends to pan down. A layer of straw or sawdust on either side of the cloches will prevent the soil packing and improve working conditions.

It is usually better to use cloches in a row rather than as individual small "glasshouses". It is essential to block the ends with glass or wood, as otherwise they act as a wind tunnel. When cloches are used individually it is sometimes difficult to find sufficient material to block the ends.

[*Sparrow*

Above—Barn cloches. This type has the wire fitting which allows the plants to be handled without the cloche being moved. Glass cut to shape blocks the ends of the rows. Below—Rectangular cloche built with 1½in. x 1in. totara framing. The glass at the sides and on the roof slides into grooves in the timber. The slightly raised ridge allows water to run off to the sides. One light is open for ventilation.



Use of Cloches in Spring

Many half-hardy and hardy plants can be raised from seed sown under cloches. The soil should be prepared in the same way as for a frame. Seed should be sown in drills along the row of cloches, not across the cloche, and sufficient space left between each row to allow hand weeding or hoeing with a narrow hoe.

Before seed is sown the width of the cloches should be marked at either end of the row and the row of seed sown so that the plants will clear the sides of the cloches by about 4in. If several kinds or varieties of plants are being sown, the low-growing types should be sown in the outer rows and the taller types in the middle. A garden line or a long, firm batten should always be laid on the ground before the seed drill is taken out. The drill should be drawn carefully with the corner of a hoe or rake. It is essential to sows seeds in straight drills, and each drill should be taken out, sown with seed, recovered with soil, and firmed before the next drill is drawn. It is possible to carry out this work in succession without touching the drills previously sown.

If one packet of seed will not fill a drill, it is best to mark the end of that variety with a stick as soon as it is sown, as otherwise varieties may be mixed or ground wasted. The labels

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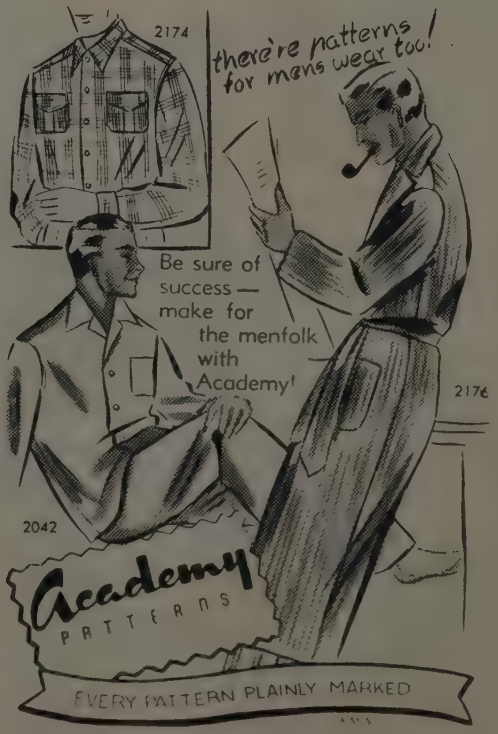


can be set to one side of the drill and will not then interfere with filling and firming the soil. Finally, the area should be well watered, the cloches replaced, and the end covers set in place.

Use of Cloches in Summer, Autumn, and Winter

Summer: Plants raised from cuttings in frames can also be propagated successfully under cloches. In January and February, when the frame may be full of seedling biennials and perennials, cloches can be used for covering cuttings of geraniums, carnations, marguerites, and Paris daisies. Shading will be needed for several weeks at this time and lime wash should be painted on the inside of the glass.

Autumn: In autumn cloches again become particularly valuable to ripen off various plants. When gladiolus corms are lifted they can be laid on sacking or raised off the soil surface and covered with cloches. Provided the ends are blocked, the high temperature necessary to ripen or cure the corms will be obtained. Selected flowering plants kept for seed can be lifted from their growing quarters as they mature. If the plants are laid on newspaper and covered with cloches, the seed will ripen quite well.

Winter: In winter cloches can be used to protect the blooms of winter flowering plants such as anemones, hellebores (winter roses), and violets. They can be used individually as miniature glasshouses and the ends need not be blocked. Provided the open ends do not face the prevailing winds, cloches will protect the blooms from damage by frost or rain.

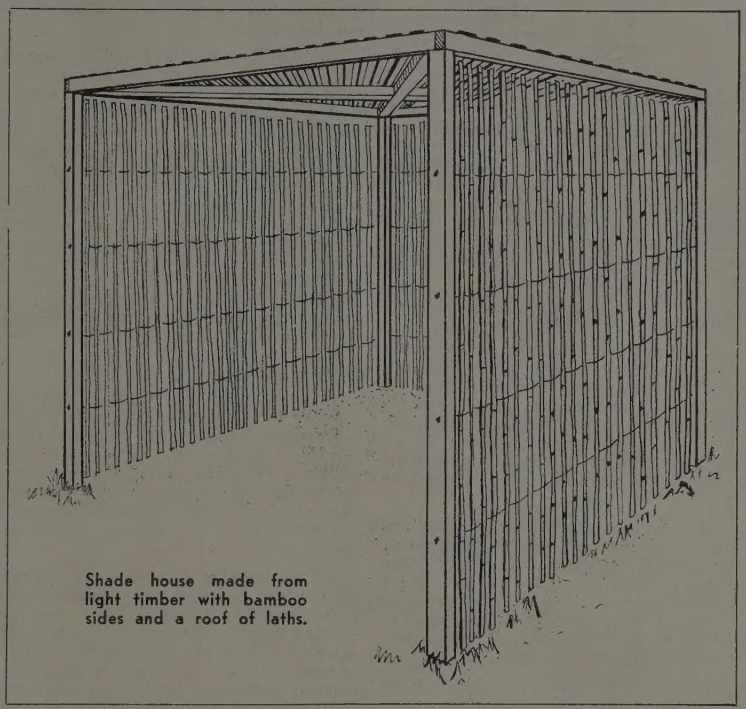
Shade Houses and Shade Frames

Home gardeners who propagate a quantity of shrubs or who grow flowering plants in pots will find a shade house or shade frame of great value. In all cases the soil should be covered with sawdust or leafmould so that the roots can be protected and kept cool and moist.

If there is a corner with native bush or tall shrub growth, all that need be done is to clear away the undergrowth, leaving the taller trees.

Elsewhere a shade house can be constructed quite simply. It should be built like an open-sided shed with a roof of laths or bamboo. These should be set at regular intervals so that light and rain can penetrate but direct sunlight is broken up. If the house is built in the open, side walls of similar construction will be needed to break the force of the wind. Light brushwood intertwined in wire netting is also suitable.

A shade frame consists of a deep frame base covered with laths. Alternatively a ridge pole extends along the length of the frame over which scrim or hessian is laid. In hot or frosty weather the hessian or scrim is unrolled and pegged down with loops of string on to hooks set into the base of the frame.



Shade house made from light timber with bamboo sides and a roof of laths.

Use of Shade House or Frame

In a very small garden that is kept filled with bedding plants a shade house or frame would be of little value, but great use can be found for one in larger gardens or where a new section is being developed slowly.

Very small shrubs can be purchased from nurseymen in pots and grown on for a year in the shade, with occasional feeding with liquid fertiliser. They should then be large enough to plant out in their permanent positions in the following autumn or spring.

Cuttings of shrubs struck in a glasshouse or frame and potted off when they are rooted can be treated in a similar manner. They will grow better under these conditions than if planted directly in the open soil.

Frequently nurserymen deliver citrus and other sub-tropicals in autumn with other shrubs. In most districts the best time to plant these is in spring, and they can be kept until this time in a shade house or frame. If the plants are in pots, these can be plunged directly into compost, but if they are balled, the wrapping sack should be loosened but not removed and the plants set into the compost. The plants will need to be watered occasionally and protected from severe frost.

Very successful ferneries have been made in shade houses. Even in dry areas such as Canterbury tree ferns and bush ferns will flourish if protected from the wind by roof and side shading. Regular spraying over with water in hot, dry weather will produce the rich, luxuriant growth typical of the bush. In a fernery the plants are grown in soil, not in pots, and this should be enriched regularly with leafmould.

Home gardeners with a glasshouse who grow pot plants such as palms, cyclamen, and orchids will find that these plants grow better in a shade house or frame in summer than in a glasshouse. Sufficient light penetrates to keep the plants growing, but the high temperatures which develop in a glasshouse in summer will not occur in partial shade. Watering and damping are reduced and pests and diseases can be controlled more easily by spraying or dusting, as this can be carried out in the correct atmosphere.

Wherever shrub propagation or pot plant growing is carried out in quantity a shade house or frame will prove of great value. Most plants, except cacti and other succulents, benefit by the cool growing conditions, because sufficient light and air are available and they do not suffer from scorching sun or drying winds.

Work for August

Though spring may not be here yet, winter rains are easing off in many districts, enabling more work to be done in the flower garden and many subjects need attention now to give a satisfactory display during the coming season. However, care should be exercised when the weather is unfavourable and the ground should not be worked when it is too wet.

Herbaceous Border

In all but the coldest districts the remains of any mulch placed on the border in autumn should be dug in now with a dressing of complete fertiliser applied at 2oz. to the square yard. Such a fertiliser can be made up of 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash.

Any herbaceous perennials requiring division should be attended to at the earliest possible opportunity. The strong growth found on the outside of a clump should be used in preference to the centre portion. New plants should be set out as soon as they arrive if soil conditions are suitable.

Some of the earliest plants, such as delphinium and phlox, will produce quite long growth in milder districts and strong shoots can be used for propagation. Cuttings are best made when the shoots are about 4in. long; the base should be trimmed off each piece just below a node and the lower leaves removed. Cuttings will root best if inserted in sandy soil, preferably in a frame or under a cloche or an inverted preserving jar.

Chrysanthemums

Chrysanthemums, even for general garden display, should be broken up every year, but best results are obtained if new plants are grown from cuttings. The old plants will be coming into growth now and from a single stool up to several dozen new plants may be made.

If offsets only are required, these should be removed from the old plants when the shoots are 4in. to 5in. long; new roots will often be found at their bases. They can be planted 4in. to 6in. apart in ordinary garden soil to develop until ready to plant out in their permanent positions. Cuttings of chrysanthemums are treated in the same manner as described for herbaceous perennials.

Dahlias

Dahlia tubers should be kept under observation so that they do not dry out excessively, and if propagation by cuttings is desired, the old tubers should be started into growth. At this time of year a glasshouse, frame, or cloche is necessary in all but the mildest districts.

The old tubers are usually planted shallowly in sand or sandy soil and kept reasonably moist. The new shoots will soon develop and cuttings are made when shoots are about 4in. long. The base of the cutting should be made close to the old tuber and if only a limited number is required, a small piece of the old tuber can be removed with each cutting to assist rooting. Cuttings can be rooted separately in a frame or round the edge of a pot filled with sand; alternatively they can be placed round the original tuber, in which case special labelling will not be required.

Gladiolus

A few gladiolus corms can be planted for early display, but the main planting is generally delayed until next month. In most districts gladiolus planted in September will flower for the Christmas period, which may or may not be desirable, depending on where the holiday is to be spent.

Where possible gladiolus should not be planted in the same position year after year, as some diseases can be carried over in the soil. It is wise to dip the corms in an organic mercury solution before planting to kill any disease organisms which may be present. Such a dip should be made up and used according to the manufacturer's recommendation.

In the warmer districts planting can be carried out of other summer- and autumn-flowering bulbs and corms, such as nerines, sprekelia, and tigridia.

Annuals

During the latter part of the month many hardy annuals can be sown in the open in northern districts, but in the south some protection by glass may be required; such subjects will include antirrhinum, calendula, *Phlox drummondi*, larkspur, clarkia, godetia, candytuft, nigella, cornflower, and stock.

Where a glasshouse is available most annuals required for summer bedding can be sown and will then be ready for planting out when frosts are no longer expected.

Strict cleanliness is necessary where seedlings are raised and watering should be done only when required. Best results are obtained when sterilised soil is used. "Damping off" is the term used when small seedlings are attacked by fungi at or about ground level. Some control of fungi can be obtained by application of Cheshunt compound at the first sign of infection. The compound is made by mixing 2oz. of copper sulphate and 11oz. of ammonium carbonate, both finely powdered. This mixture can be kept in an airtight jar and used when required at 1oz. to 2 gallons of water. It must be copiously watered on.

No rubbish or weed growth should be left about, as it may harbour insect pests, which play havoc among seedlings.

Lawns

Spring sowing of new lawns can be done during August in all but the coldest districts. The ground should have been made ready last month. Details of seed mixtures and fertiliser application were given in the flower garden notes in the February issue.

Established lawns will now be coming into active growth and will benefit by a rolling to consolidate the turf after the action of frost and rain. This is especially important on lawns sown last autumn. Great care should be taken when a new lawn is being mown; the mower should be sharp and set fairly high. The blade can be lowered gradually as the season advances. The clippings should not be left on the lawn at this time of the year.

Lawns cannot be expected to grow vigorously and remain healthy without manuring. This is a good time for an application; a suitable mixture consists of 3 parts of sulphate ammonia and 1 part of superphosphate, which should be applied at 1oz. to the square yard.

Trees and Shrubs

Trees and shrubs planted during autumn or winter should be inspected periodically to ensure that they have remained securely in the ground. Plants that have not been staked may have become loosened by strong winds while the ground was wet and may require firming.

Early-flowering trees and shrubs should be pruned immediately after flowering. Rose pruning should be continued and completed before the end of the month in all but the coldest districts. Rose pruning was discussed in last month's notes.

Glasshouse Plants

Early spring is the time to recondition decorative pot plants. If repotting is not considered necessary, the topsoil should be removed and replaced with fresh potting compost. Some trimming of the tops of plants is often required and will provide material for cuttings. Geraniums, fuchsias, heliotropes, balsams, iresines, coleus, and shrubby begonias all root fairly readily at this time of year.

Tuberous begonias and gloxinias can also be started in northern districts, but in southern districts if a heated glasshouse is not available, they are better left until next month.

Hydrangeas in pots can now be taken inside. When growth has begun they will benefit greatly by weekly applications of liquid animal manure.

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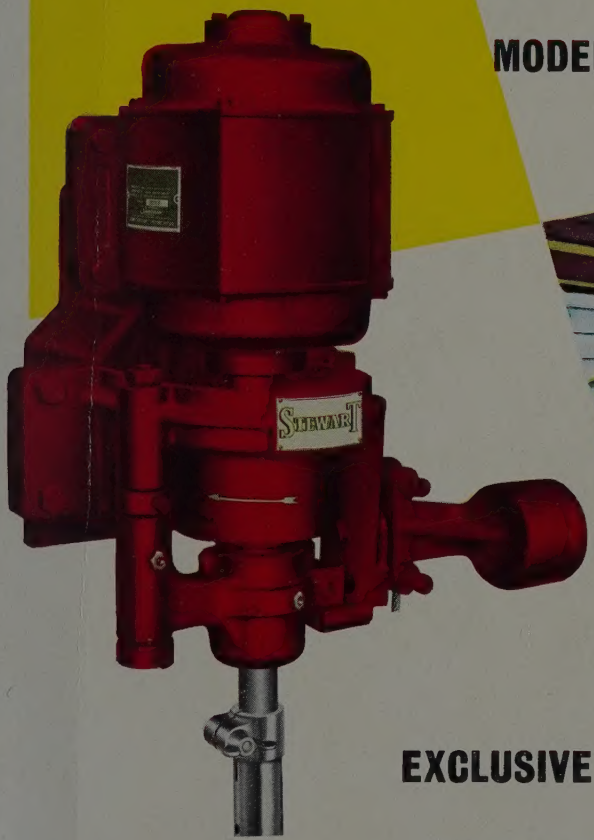

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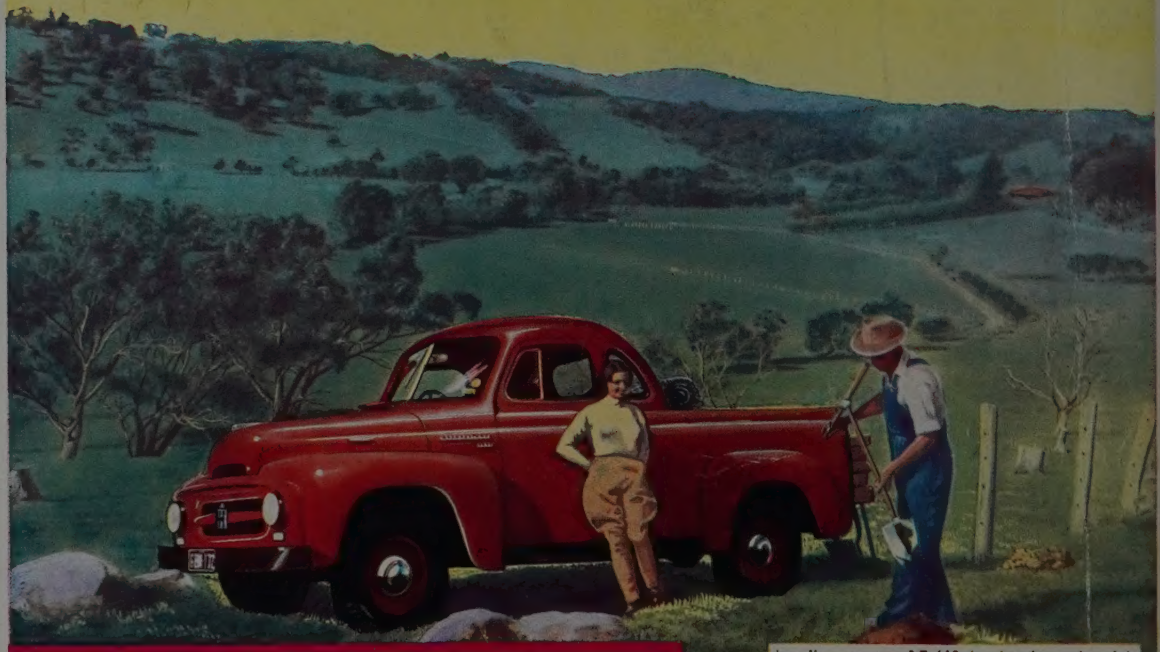

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